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AN ADVANCE IN SUBSCRIPTION RATES

TO OUR READERS:

It is with genuine regret that we find it necessary to announce that it has become necessary to increase the subscription rate to $3 for readers throughout the United States, Canada and Mexico and to $5 for readers in other countries. I believe that practically all of our readers know that the publishing business, like the railroad and all other businesses, has been subjected to large increases in its cost of production and that they will understand without an explanation why it has become necessary for us to make these advances. There are, however, a number of influences which especially affect the publishing business about which I believe our readers should be informed.

Most of our readers have doubtless heard from time to time of the great increase in the price of paper and the shortage in supply, but they probably have no adequate idea of what these changes in the paper situation have meant to publishers. The white paper used by newspapers and periodicals constitutes one of the largest items in their cost of production. During the first six months of the year 1920 the expenditures for paper for the *Railway Maintenance Engineer* and other railway papers published by the Simmons-Boardman Publishing Company were *194 per cent greater* than for the first six months of 1919. This increase in cost was due only in a small degree to an increase in the amount of paper used. It was due almost entirely to advances in the price that we have had to pay. On the basis of present prices, the white paper alone which is used in the *Railway Maintenance Engineer* costs over $1.25 annually for each subscriber.

Even if the advances in the price of paper were the only increases in cost that we have had to meet they would be serious, but they by no means stand alone. During the first six months of 1920, the expense of typesetting, presswork, binding and postage of our railway papers was *125 per cent greater* than in 1919, while on July 1 another increase in zone postage became effective and on August 25 another increase in the cost of printing took effect. During the same period the increase in the cost of engravings used as illustrations in our editorial pages was *265 per cent.*

The foregoing statistics indicate the increases which have occurred in our "manufacturing costs." We have also been affected by the same increases which have compelled business concerns of all kinds to increase the salaries and wages of their employees.

Publications of all kinds, owing to similar developments, have been forced to advance their subscription rates. Metropolitan newspapers which formerly sold for one cent are now being sold for two and three cents. Most magazines have likewise increased their subscription rates.

No publication has ever received more loyal support from its subscribers than the *Railway Maintenance Engineer.* We have endeavored to reciprocate by publishing a paper which would be both interesting and helpful to them in their work. It will be our endeavor in the future, as it has been in the past, constantly to make the

Railway Maintenance Engineer a better paper, and we confidently hope not only to retain all of our present subscribers at the new rates, but to go on, as we have in the past, steadily increasing the number of our readers.

E. T. HOWSON, *Editor.*

An Established Institution

Every reader who turns to the first page of the Roadmasters' convention report appearing in this issue will have one thought uppermost in his mind—the Roadmasters' and Maintenance of Way Association is a venerable institution. This fact is established beyond any question by the heading "Thirty-Eighth Convention." Many of the present members of the organization were not born, when 60 roadmasters assembled at the Mattison house in Chicago on June 13, 1883, at the call of I. Burnett of the Chicago, Rock Island & Pacific to organize the Roadmasters' Association of America. Times have changed since that important occasion. The railroads of the early eighties were crude affairs if judged by the standards of the present. Yet after all the problems were essentially the same. It is interesting to note that the subjects discussed at this first meeting included rail creeping, substitute ties, drainage, nut locks and labor saving devices. That the character of the meetings did not differ greatly from those of modern times is indicated by the fact that the plans for the meeting included an excursion to the rolling mills at South Chicago on a special train supplied by the Chicago, Rock Island & Pacific. But what is still more important is the incentive which caused this group of roadmasters to assemble in Chicago in that year, namely, the occasion of the National Exhibition of Railway Appliances which was held during the month of June, 1883, in the Exposition building on the lake front. Thus, from the very beginning of this, the first of the maintenance of way associations, the supply exhibit has played a most important part.

Profiting by Enforced Conditions

It is interesting to note the number of railroads that are now planning to carry on a large part of their maintenance work through the winter season. In the majority of instances, at least, this is an enforced condition made necessary or even imperative by the impossibility of securing sufficient material or labor during the normal season. The roadway and structures must be maintained and this apparently is the only way in which it can be done. The two vital points in connection with this are contained in two very pertinent questions. Are the roads going to profit to the fullest extent by the lessons which they will learn, or are they going to handle their winter labor, housing and maintenance problems in a makeshift and temporary fashion instead of endeavoring to give this class of work every chance to prove its future worth? Much has been written about the advisability, desirability and value of winter maintenance work, both in regard to the amount which can be accomplished and in regard to its beneficial effect upon obtaining and holding men of good quality. As the situation stands now, it can be treated solely as an expedient to tide the roads over until the old methods can be resumed, and nothing will have been gained, or it can be made the basis for a valuable experiment that will throw new light upon future maintenance programs. The fact that the work simply had to be done has been given as the reason for pushing it this winter, yet nearly all of the maintenance officers so concerned are agreed that it can be done, and without any great difficulty. With that the case, then, there would seem to be no sound reason why the work should not be handled on a more permanent basis and every effort made to develop its possibilities for future betterment and progress in the maintenance of way department.

The Employee and "His Road"

If each one of the half million employees in the maintenance of way department owned that part of the road for whose upkeep he is responsible, vast economies would be effected over night. Men would be required to render a day's work for a day's pay, the waste of materials would be stopped, lost motion due to inefficient management would be reduced; in fact, every man would be on the alert to detect and stop leaks. That this attitude does not prevail universally is evident to all. That it is the ideal to which every railway employee should strive is equally clear. The roads emerged from the last phase of federal operation and guarantee of revenues on September 1. They are now dependent solely on themselves for their future success. They have been returned to their owners with operating costs greatly in excess of those prevailing when the government took them over. It is a public duty as well as a corporate necessity that all reasonable economies be now introduced. Every employee of the maintenance of way department, from the chief engineer to the laborer in the gang, can aid in this movement.

BE MORE THAN AN ENGINEER

THE GREAT problem of the engineering department of the railroads has been to provide a suitable outlet for its rapidly developing members. Because men cannot be promoted as fast as their qualifications merit many of them look for opportunity elsewhere instead of waiting for vacancies in the railroad positions ahead of them. Perhaps one of the most important reasons for this condition is that no other branch of railway service has so large a portion of its entire personnel qualified for advancement. A larger proportion of the men are above the classes of laborers, artisans or clerks and, therefore, occupy positions requiring the exercise of initiative, if not executive ability. Also in nearly all cases they are employed on a class of work that calls for intense personal interest rather than the mere completion of some task.

This has raised the question of providing opportunities for broadening the activities of the engineer on the railroads so that he will be enabled to branch out into other departments. Some roads, in fact, do provide a definite line of promotion from engineering positions to those of assistant division superintendent or superintendent. It is also true that on roads not providing such special opportunities, engineers of exceptional ability have been selected for important operating and executive positions and in other cases some engineers have courageously given up responsible technical positions to serve apprenticeships as trainmasters at lower salaries so that they could get in line for superintendencies. Based on a study of these facts, various suggestions have been brought forth for a form of railway organization that would enable engineers to obtain a sufficiently broad experience to qualify as operating officers.

Whether or not such definite opportunities are provided or whether, in fact, the engineer deems it necessary for him to look for promotion outside of his own department, he owes it to himself to know as much about the railroad as a whole as he is able to learn by conscientious study and intelligent observation. In other words, he should be more than an engineer. Officers of the maintenance of way department have a most excellent opportunity for developing the broadened viewpoint. In few

other branches of the service is the officer brought in contact with so many other departments, while the particularly close contact with the operating department affords special opportunity for developing a knowledge of that important branch of the service. Even though efforts for broadened knowledge do not lead to advancement through other departments, they will be amply repaid through the greater measure of respect that will accrue to the man with the greatest amount of definite practical knowledge.

THERE IS NO PROGRESS IN MARKING TIME

IN THIS DAY the organization that does not go ahead soon finds itself going backward. It may mark time for a short period due to economic conditions without serious detriment, but unless active attempts are made to break through the crust thus formed there is every likelihood that it will degenerate into a serious form of backsliding. This is clearly portrayed in our present condition in the maintenance of way department. The neglect of the roadbed, the slackness in the organization and the inability to secure track materials during the war and the shorter period of readjustment from government to private control could not help but affect the morale of the men from top to bottom. This has created a state of lethargy on the part of those who are looked up to and expected to build up and further the efficient working of the maintenance forces. Too many are following the war program of merely maintaining the track and giving but little thought to the future, when, even though materials may be plentiful, labor is not so likely to be.

Certainly there never was a more opportune time since 1914 to put in strong, telling work on this problem. So far as numbers go, the track forces are in a much better shape than they have been for some time. With the shutting down of numerous factories all over the country, a certain percentage of the men so thrown out of employment have naturally gravitated to the railroads. There is no reason to doubt but that a large number of these men can be held in railway service, and advantageously so.

It is true that the efficiency of the men has fallen below pre-war standards, but this is not confined to the railroads, for it is country-wide. It is perhaps due chiefly to an awakened desire for better living conditions and it has resulted in a restlessness, a dissatisfaction which is always detrimental to efficient work. Other industries are recognizing this and are using every possible means to combat the dissatisfaction and to direct this desire into the channels where it will benefit both the laborer and the industry.

It is equally true and well recognized that labor will never go back to the old standards of living, and to hold their place the railroads must "get in the van." Few if any of the roads have ever adopted a real constructive labor policy. It has always been a case of marking time, yet for the amount of money involved in this class of work it is the cheapest improvement that could be made and doubtless if actual figures could be kept, would show a greater return on the investment than perhaps any other single railway improvement. This is high time for broad, constructive thinking and not for "single track" minds.

Individual Responsibility

The present month, marking as it does the complete restoration of the railroads to their own managements bring us face to face with problems which are without doubt the most important in the history of this railroad system. Our reputation and standing, as individuals and as an organization, are staked upon our ability to solve these problems successfully. Every man and woman in the service of this railroad has a distinct, individual share of this great responsibility, which cannot by any possibility be honorably evaded or shifted to the shoulders of another. We should never forget that railroad wages are paid by the people who use the railroads; there is no other source from which they can come. Satisfied patrons, receiving good service and courteous treatment, are far more likely to continue willing to pay the rates necessary to maintain generous wage levels than are patrons who are poorly served or discourteously treated. *From a statement made by President Rea to the employees of the Pennsylvania System, on September 8.*

THE ECONOMICAL WEIGHT OF RAIL

IN THE RENEWAL of rails in heavy traffic main lines it has been customary to increase the weight from time to time according to more or less arbitrary conclusions. In general, these conclusions have been based almost entirely on considerations of safety. In a report presented before the Roadmasters' Association and abstracted elsewhere in this issue, the consideration of economy is presented in a tangible manner. Although based on limited data, this report brings out certain comparisons not heretofore available and within the limits justified by these data enables certain conclusions to be drawn as to the relative economy of various weights of rail for different densities of traffic.

In selecting rail, the greatest economy will be secured by choosing that rail which is cheapest in the end, taking into account the interest on the original investment, the amount of money that should be set aside each year to provide a fund with which to buy new rail at the time that the rail in track requires renewal, and the difference in the labor cost of maintaining rails of different weights in track. A rail wears out only under traffic and its life varies directly with the number of cars and locomotives passing over it. Under light traffic a rail, therefore, renders a long life, while on a busy line the reverse is true. Since the labor charge of laying rail is independent of its life, the proportion that this cost bears to the total annual cost for rail becomes less as the interval between renewals increases. It is this fact which causes the annual cost of rail to vary and creates an economical limit for rails of different weights. On the basis of the data which the committee collected from one road on lines handling not less than 400 cars per day, it was found that rails weighing less than 100-lb. per yd. are not economical, while rails of heavier sections were justified when the traffic exceeded a certain number of cars per day. While these figures cannot be applied universally, the committee has developed a method by means of which other roads can use their own traffic figures and statistics of cost and arrive at conclusions applicable to their conditions. The application of this method will do much to transfer the decision on this important matter from the realm of conjecture into that of mathematical analysis.

ENGLISH TRACK MAINTENANCE BEGETS INTERESTING METHODS

More Permanent Construction and Heavy Traffic Afford Numerous Contrasts With American Practices

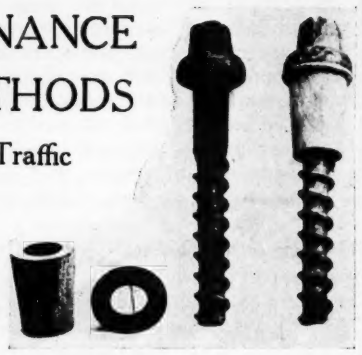


Fig. 1—Noise Insulators

Fig. 2—Wooden Noise Insulators

MAINTENANCE methods in the London tubes differ as much from those of the surface railways of England as the practices in the New York subways vary from those of the steam railways of the United States. However, track construction and track maintenance methods in the London subways are committed to English railway practices and include considerable work in the open. Consequently a paper presented by A. R. Cooper, engineer, Underground Railways of London, England, before the Permanent Way Institution of England on "Engineering Maintenance on Underground Railways" gives considerable insight into the maintenance of way methods practiced on the English railways. Excerpts from this paper which are believed to be of interest to American railway men are presented below:

Inspection and Repairs

In underground railways carrying extremely heavy traffic the matter of inspection and the speedy repair of any breakages or defects are important phases of the maintenance engineer's responsibilities. Mr. Cooper describes the matter in which this is handled as follows:

"On the Underground Railways special attention has been given to the question of dealing as promptly as possible with breakdowns or defects which may interfere with the train service. This matter is of special importance where a train service of 1½-min. headway is maintained during the busy times. Men are stationed at certain points throughout the road who are always available to attend to any defect that may occur. The importance of the type of failure determines the distance apart of these points of call or call-depots. These men carry out inspection and maintenance work, but are always in touch with the signal cabin to which any messages for them are sent. The signalman is provided with a "hooter," which he uses to call these men if required. On the Tube Railways very little, if any, inspection and maintenance work can be carried on during traffic hours, and in consequence the depots are laid out for carrying out work more in the nature of shop repairs. Many defects or breakdowns require the use of spare parts, material or tools. These are kept ready at certain places on the line, their location being shown on a diagram of which a copy is supplied to each foreman and other person concerned."

Special Conditions

Sanitation and noise are special considerations which have an appreciable effect on the track design and have led to special construction for the same reason that special track work eliminating ballast has been found desirable in some of the large passenger stations in this country. Mr. Cooper said:

"In considering the form of track suitable for use on Tube Railways the question of sanitation calls for special attention. From this standpoint, ballast in any form is objectionable, as it does not allow of dirt and rubbish being easily cleared out. On the original track of the L. E. R. crushed granite was used at the ends of the ties as well as one inch deep between them. This ballast has been entirely omitted in the recent extensions, and in the older stations we have removed the granite and substituted a flush concrete surface.

"Noise on the Tube Railways is a source of frequent complaints, undoubtedly with some justification, but up to the present time our attempts to reduce it have not met with much success. The problem is quite distinct from that of noise or vibration caused in adjoining property. A case of noise in adjoining property was successfully dealt with by installing rubber pads between the ties and the concrete; this arrangement, while preventing noise being transferred through the tunnel lining and earth to the surrounding property, in no way lessened the noise in the tunnels. With the object of reducing noice in the tunnels ¼-in. felt pads were installed between the cast-iron chairs and ties; further, the coach screws holding down the chairs were insulated from the chairs themselves. The illustrations at the head of the article show the two methods of carrying this out. Fiber bushings with fiber washers, as shown on the left, are installed on 50 miles of track on the L. E. R. The second form, shown on the right, has wood bushings with fiber washers; this form is installed on a few miles of the Central London Railway. These bushings, as will be seen, are tapered and are practically similar to hollow trenails. Both types of fittings cost, at pre-war prices, about $140 per mile."

Rail Wear

Rail wear and rail breakages are also important items and electric traction introduces the phenomenon of corrugated rail tops not ordinarily encountered on steam railways. This has led to the practice of resurfacing rails.

"One effect of electric traction on the permanent way is to cause uneven wear on the rail surface. This occurs mainly on curves, and the hollows take place at from 2 ft. to 5 ft. centers, in some cases reaching 1/16 in. in depth in a period of 4 or 5 months. This uneven surface causes bad riding, and it is necessary, therefore, to change the rails, even with a reduction in section of a few per cent.

"On the district railway our practice is to take out rails as soon as hollows develop to a depth of about 3/32 in. to ⅛ in., and if these hollows do not show a reduction of section above a certain amount (about eight per cent) the surface is restored on a planing machine and the rail put back in the track. We find that these rails have a second life as long as the first one when dealt with in this way. The following rules are observed in carrying out this practice:

Rails are not machined more than once.

Rails are not machined when such machining would entail a greater reduction of section throughout than eight per cent.

Rails taken out of a curve if replaced in a curve are put in so as to lie in the same direction as before.

Each rail, when removed for machining, is marked to show the number of ties installed per rail length. It is put back in a place where it will be supported at the same points.

The last two precautions are taken to avoid reversal of stress in the rail material.

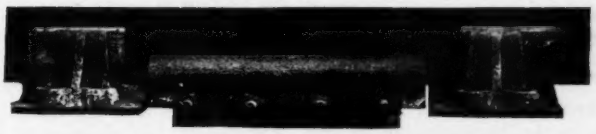


Fig. 3—Emergency Rail Joint for Broken Rail

"Before the war the cost of taking out rails, machining them and replacing them in the track was about $5 per ton, whereas new rails, making allowance for scrap value, would have cost about $24.50—a saving of $19.50 per ton. About three miles of rail are treated in this way on the District Railway each year, or about 15 per cent of the total rail renewals.

"The usual causes of rail failures are well known to most members of the Permanent Way Institution, but the introduction of electric traction has provided a new cause. The effect of an electric arc on rail steel is the same as a "nick," and some of the fractures which have taken place on the Underground Railways have directly resulted from this cause."

"A device which has been provided with the object of minimizing traffic delays from broken rails is the clip rail joint shown in Fig. 3, which has been supplied to all sections. It is suitable for use on many cases of fracture and can be applied in a comparatively short time."

Special Track Work

Heavy traffic in England, as in this country, has introduced some serious problems in connection with the maintenance of frogs and crossings and has led, in a like manner, to the use of manganese construction.

"Electric traction is very severe on crossings and frogs and in consequence their maintenance has received particular attention. The introduction of manganese steel has been of great advantage; crossings and frogs of this material have in all cases been used on the Tube Railways since about 1904, and on the District Railway at busy places. The form adopted for the Underground Railways is a casting, though some roads have in recent years made use of rolled manganese rails for building up special track work. We find castings quite suitable for the class of traffic on the Underground Railways, though I am inclined to think that for higher speeds and heavier axle loads there is much to be said in favor of the built-up construction. In the short leads which are in use at junctions on the Tube Railways the castings are arranged to connect up to each other; i. e., special attention is given to limiting the number of joints. Fig. 4 shows the junction at Queen's Park, which can be taken as a standard type."

Surface and Line Diagrams

"Part of the work of the engineer's department is to provide a track that will insure smooth riding of trains. This is also dependent upon the rolling stock and a complaint from passengers of bad riding may concern both track and cars. We provide each track foreman with a motor compartment pass and he is required to travel frequently over his section. To assist foremen in locating faulty places records are taken on a special instrument. Fig. 5 shows some records obtained in this way. The diagrams have a distinct value in comparing one section of the line with another, and form a useful record of the standard of maintenance obtained in any section. Work on the permanent way is apt to become monotonous, and there is always a possibility of a lack of interest developing; in any case, I do not think the best work can be obtained unless it is known by the men that it is recognized and appreciated. Foremen are supplied with copies of the charts relating to their own sections, and are able to note the places where bad riding is recorded. Diagrams taken three or six months later (on the same car and at the same speed) are also supplied to the foremen concerned, so that they can compare them and see the actual results of any special attention given to the bad places. At the same time they realize that the company is aware of the improvement made."

Shrubs and Trees

"The work of the permanent way section with regard to embankments and cuts has its more aesthetic side. Railway surroundings are likely to be dismal and uninteresting in the neighborhood of large towns unless special efforts are made to improve them. A start was made in 1909 with the District Railway by planting shrubs along the banks and this same policy has been continued ever since.

"This planting of shrubs has the result of strengthening the slopes as well as beautifying them, the latter effect being of benefit to both the public and the staff. Last

Fig. 4—Junction Layout at Queen's Park

year we started a nursery with the object of providing for a large part of our future requirements in shrubs."

BRIDGES

"In times of stress—such as that of the last few years—there is a tendency to starve the maintenance of the bridges; in fact, any reduction of maintenance costs is apt to take place in this section first. The ill effects do not become apparent or dangerous for some appreciable time, though in the long run very heavy expenditure in comparison has to be incurred to put right the evils.

"There is one form of bridge construction on the District Railway which is giving us a good deal of trouble. Many bridges were constructed with a trough floor supported by main girders, the troughs being partly filled with ballast and the ties laid direct therein. Naturally the troughs very soon become filled up with ballast and dirt, making it practically impossible to inspect the in-

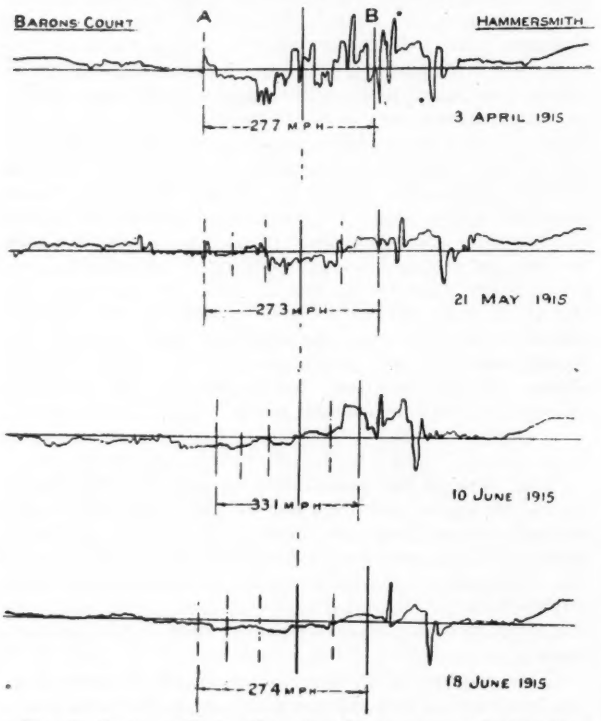


Fig. 5—Surface Charts Showing Improvement in Track During 2½ Months

ternal condition or to maintain proper drainage. Some troughs have rusted very badly, and in one case right through. To overcome this difficulty we have during the last seven or eight years adopted the policy of keeping the whole structure entirely open.

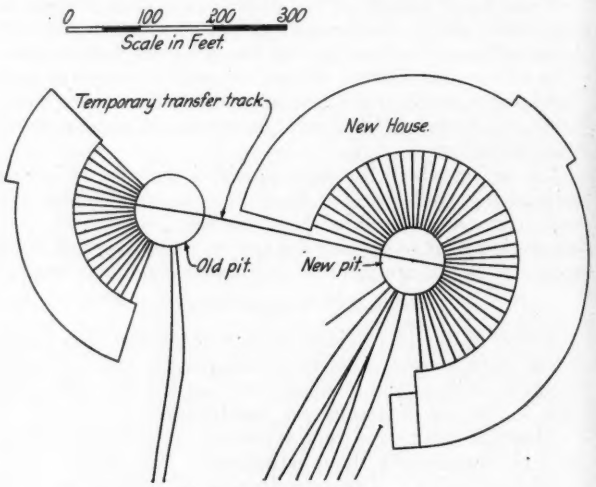
There is another advantage in removing the ballast from the troughs, viz., that the dead load is materially reduced. For instance, on the Boston Manor bridge the removal of the ballast reduced the stress in the main members by 20 per cent.

REINFORCED CONCRETE

"In connection with railway maintenance, it is of interest to note the increasing use that is being made of reinforced concrete, which is now coming into general use not only for new structures, but also for repairs and reconstruction. Some of the large railways, which have good supplies of stone or gravel available on their properties, have set up plants for the manufacture of concrete articles. The Underground Railways are not large enough to undertake the manufacture profitably, but distinct advantage is obtained by purchasing in this material. For instance, signal posts 20 ft. long purchased in 1917 cost $30, while pitch pine posts at that time would have cost about $34. There is a saving in actual cost, but it will be appreciated that the chief gain is that the concrete post practically never requires renewal."

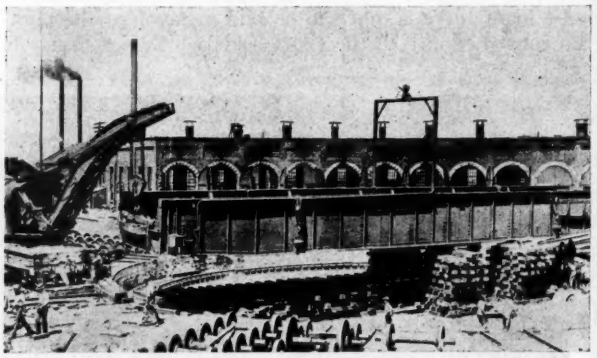
ERECTING A TURNTABLE WITH A "TEETER TOTTER"

THE PROBLEM of transferring a turntable from an old to a new site on car trucks at the new Union Pacific engine terminal at Council Bluffs, Iowa, led to the use of a novel method of erection. The program of the work necessitated lifting the table out of its old pit and lowering it into the new one in much less time than it could have been accomplished by jacking alone. At the same time it was not convenient to have enough lifting equipment on the ground in the form of derrick cars, cranes, etc., to handle the turntable by direct lifting.



Layout of the Transfer

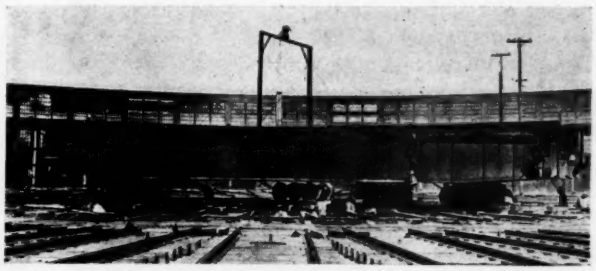
The drawing shows the location of the new and old roundhouses and the position of the track over which the table was handled from one pit to the other. The first photograph shows the table at the old site and how it was lifted with the aid of a single wrecking crane with a hitch at one end of the table only. Two pairs of cribs were built up under the girders as shown, one pair just a few feet off the center and the other pair about 10 ft. nearer the end. When the table had been disconnected from the center bearing the crane lifted one end of the table until it cleared the near cribs a sufficient amount to enable one tier of blocking to be added to the crib-



See-Sawing the Table Up Out of the Old Pit

bing. Then the crane lowered away until the table rested on the near cribs and cleared the far cribs enough so that they also could be raised by one tier of blocking. This teetering action was repeated, adding a tier of blocking each time until the table had been raised high enough to clear three car trucks running on a track laid on cribbing built across the turntable pit directly under the table. This cribbing is also shown in the photograph and had been built up under the table as high as the clearance would permit before the raising process was started and was finished while the work was in progress.

The trucks used to carry the table were fitted with heavy oak bolsters to take the load. As soon as the table could be let down onto the trucks it was hauled off the pit by an engine. A crane with a long boom then reached over the center of the pit, lifted out the turntable center and transferred it to the center foundation in the new



The Table on Trucks Over the New Pit

pit. When the center had been properly installed the turntable continued on its journey to the new site where a track had been laid on cribbing across the new pit in the same manner as at the old one. Four blocking cribs had also been erected so that the table could be lowered to bearing by a see-saw process just the reverse of that used to raise it from the old pit. Before this work could be completed it was necessary to remove the track and the cribbing that carried it so that they would clear the table. The distance between the new and old pits is 340 ft. and the entire time taken for the transfer from the time that engines were orderd out of the old roundhouse until they were admitted to the new was 14 hours.

The same method was used by the Union Pacific at Junction City, Kan., except that there the distance over which the turntable was moved was 1,600 ft. and involved the traversing of several switches and two sharp curves.

COMPARATIVE VALUE OF TIMBER CUT FROM LIVE AND DEAD TREES*

PREJUDICE exists in certain quarters against the use of timber cut from dead trees, and some purchase specifications insist that only timber cut from live trees will be acceptable. As a matter of fact, when sound dead trees are sawed into lumber, and the weathered or charred outside is cut away, there is no method known to the Forest Products Laboratory by which the lumber can be distinguished from that cut from live trees, except that the lumber from dead trees may be partly seasoned when sawed.

All the information available at the laboratory indicates that timber cut from insect or fire killed trees is just as good for any structural purpose as that cut from live trees of similar quality, providing the wood has not been subsequently injured by decay or further insect attack. If a tree stands on the stump too long after it is killed, the sapwood is likely to become decayed or badly infested by wood-boring insects; and in time the heartwood also will be similarly affected. The same thing is true of logs cut from live trees and not properly cared for. Until the wood becomes affected by these destructive agents, dead tree wood should be just as strong and just as durable as sound live tree wood.

In considering the subject it may be useful to remember that the heartwood of a living tree is entirely dead and in the sapwood only a comparatively few cells are living. Most of the wood cut from trees is dead, therefore, regardless of whether the tree itself is living or not. Such being the case, purchase specifications, instead of providing that material must not be from dead trees, should state that material showing evidence of decay or insect infestation exceeding a specified limit will not be accepted.

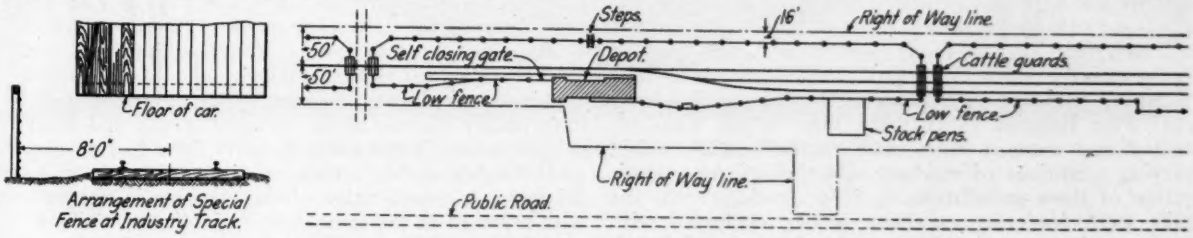
*From Technical Notes No. 101, issued by the United States Forest Products Laboratory, Madison, Wis.

FENCING STATION GROUNDS ON THE LOUISVILLE & NASHVILLE IN FLORIDA

THE CUSTOM of allowing stock to run wild in Florida and placing the burden of fencing entirely upon the individual who desires to keep it off his property resulted in such heavy stock damage claims at certain stations of the Louisville & Nashville in Florida that the road was compelled to fence in its station grounds at a number of places. Thus, instead of having the station grounds entirely open to the public from one end to the other, they have been fenced in as shown on the small map, so that no animals can get on the tracks anywhere except between cattle guards at road crossings.

For the purpose of permitting free communication from one end of the station grounds to the other, the fences have not been placed on the right-of-way line in all cases but have been set in so as to give lanes 15 ft. wide or more between the fence and the right-of-way line. The fences are brought up to the station building, so that access may be had to the station platform only by passing through the building or through a self-closing gate adjoining it. On the side of the right-of-way opposite the station, steps have been provided over the fence as a means of convenient access that will obviate a detour to the nearest road crossing.

In working out this plan a special problem was presented by the industry tracks. The fence had to be arranged in such a way as to keep out the stock and still



Typical Fencing Layout and Relation of Industry Track Fence to a Car

avoid any serious interference with the loading or unloading of cars into wagons or trucks. To this end, the design of the fence adjoining the industry track was modified as shown in the cross-section. The posts were placed 8 ft. apart and capped by a 6-in. by 6-in. stringer, while the fence was so placed that it gives a net clearance of 8 ft. from the center line of track. By making the fence 4 ft. 6 in. high above the base of rail, the top of the stringer is just about level with the floor of the car. Thus the fence is of proper height and adequate strength to be used readily for supporting skids to bridge the distance between a wagon and a car. A low fence of the same character is used adjoining the station platform for convenience in handling baggage and freight.

Experience with this method of fencing station grounds has shown that it causes no appreciable inconvenience to the public, while effecting a marked reduction in the stock claims at stations, in addition to eliminating unnecessary use of the tracks and right-of-way by unauthorized persons. We are indebted to M. E. Batts, roadmaster on the Louisville & Nashville at Pensacola, Fla., for the above information.

Deseaming Rails Decreases Failures

IT HAS BEEN thoroughly established by tests and a study of rail failures that there is a close relationship between base fractures or half-moon breaks, as they are sometimes known, and a seaminess of the rail surface. This seaminess is ascribed to the original surface condition of the rail ingot, the process of casting resulting in the formation of small flaws in the surface which are drawn out into seams under the action of rolling. The prevailing opinion is that these seams in the rail surface serve as the nuclei for the formation of cracks that result eventually in fractures.

Another defect in rails is the presence of a very thin surface of softer and therefore weaker metal over the surface of the rail, which is ascribed to the presence of a $\frac{5}{16}$-in. thickness of decarbonized steel next to the ingot mold. This layer of soft steel is rolled out into a very thin coating on the rail which becomes detached and forms fins or flakes.

It was in the effort to eliminate these two recognized and menacing defects in steel rails that the Lackawanna Steel Company's deseaming process was devised and installed as a part of its standard practice about six years ago. The method consists essentially in treating the rail bar while hot and during the rolling by milling off the surface of the head and base sufficiently to secure freedom from surface defects. Not only are the seams in the head and base eliminated, but the softer, partially decarburized surface is also removed so that the rolls in the remaining passes do their work on the true higher carbon steel of the rail bar.

The finished rails made by this process show an absence of the seams and surface defects on the head and base so characteristic of rails produced by the ordinary process, and in addition the harder, firmer surface resulting from the elimination of the soft, partially decarburized layer of metal aids materially toward greater service and reduction of wear. The improvement in head surface in regard to wear and flow of metal is hardly less important than the increased safeguard against base weakness and failure.

In the beginning the treatment was applied only to the base portion of the rail bar, but after careful inspection and investigation had proven the efficacy of the development in removing the weak, seamy metal of the ingot, the practice was extended to include both head and base locations, and since the middle of 1914 the deseaming process for both head and base has been a permanent part of Lackawanna practice in the production of standard rails.

During 1914 and 1915, about 50,000 tons of deseamed rails were supplied to 11 trunk lines in the southern, central and western states, and installed under widely varying conditions of roadway and traffic. An investigation of these installations in 1916 developed that the rails were rendering excellent service compared with past experience on the same roads, although the length of time they had been in use was hardly sufficient for conclusive results.

In 1920 a further investigation was made, covering nearly 125,000 tons of rail laid in 1914 and in subsequent years on seven trunk lines of the northwest. In this total tonnage only 45 failures have been reported, of which 15 were classified as "broken rails" and two as "base breaks," so that if even 17 of the failures are classified as being caused by surface defects, this total relative to the entire tonnage is exceedingly small.

The following are excerpts from reports of this investigation as concerning some of the individual railroads involved:

On one road over 1,000 tons of deseamed rails had been in service since 1915 with no failures of any kind developing to date. The standard section of this road is a thick base design, but even with this type the number of base failures in rails of ordinary manufacture was such as to draw the special attention of the Interstate Commerce Commission.

One of the largest trunk lines serving the Northwest has approximately 17,000 tons of rails in its tracks made under the deseaming process and installed from 1914 to date. In this entire tonnage no breaks of any kind had occurred up to the time of the inquiry, although the severe traffic conditions had developed numerous failures in rails of other mills. One of the most prominent roads of the central west has in service nearly 12,000 tons of deseamed rails. In reporting rail failures to the American Railway Engineering Association for 1918, no base breaks were shown in this tonnage, a total of 8 failures only of all classes being recorded, these failures all traceable to causes other than would be affected by the deseaming process.

On another large system serving the central and northern states only 10 failures of any nature have occurred in 30,000 tons of deseamed rails laid in track beginning in 1914, none of which were base breaks. In 36,000 tons, representing the installation on one of the systems, 22 failures were reported in the A. R. E. A. statistics for 1918, 2 only being classed as base failures. On the other system, an installation of 27,000 tons developed, according to the same record, only 5 failures, none of which occurred in the rail base.

The rail failure statistics of the A. R. E. A. carry reports on approximately half a million tons of rails made since 1914 by the deseaming process. This tonnage embraces a considerable variety of rail sections and chemical specifications, and is installed under widely differing conditions of climate, maintenance and service, making it extremely representative for comparative and analytical purposes. In the entire quantity there had developed up to the date of the compilation of statistics only ten base failures. A consideration of this showing in comparison with a record in the same period of 249 base failures in approximately three million tons produced by the ordinary practice in five other mills is illuminating.

Railroading Here and There

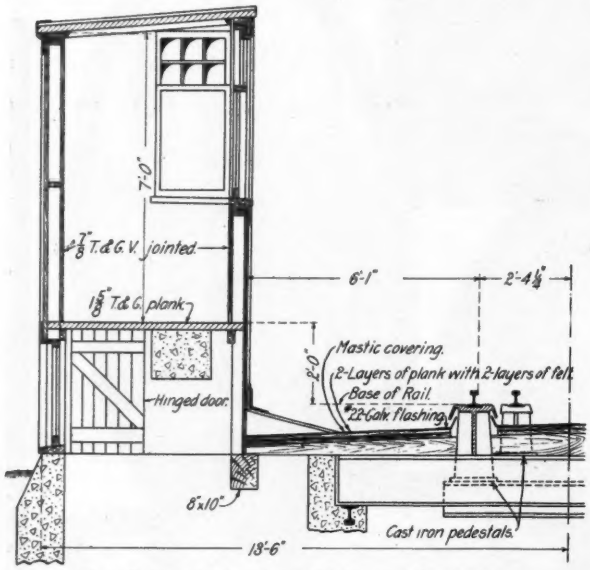
MAKING RAILROAD CROSSTIES IN THE SOUTHWEST

Successive steps in transforming the tree into the finished product.

AN IMPROVED ARRANGEMENT FOR TRACK SCALES

TWO NEW features in scale house and platform design have been introduced by the Canadian Pacific which contain several valuable ideas. They consist chiefly of the elevation of the floor of the weighman's house about 2 ft. above the base of rail, and the construction of a tapered scale platform whereby better drainage is secured.

In carrying out this work no changes have been made



Section Through the Scale Floor and Scale House

in the old pit or in the old stringers which carried the dead rail stand. The new scale house is constructed of timber and is approximately 13 ft. long by 5 ft. wide, the floor being 2 ft. above the base of rail, with a 7-ft. ceiling. The house is supported by the edge of the concrete pit and by an 8-in. by 10-in. foundation timber running lengthwise of the pit. Lighting is provided by five sliding sash windows, 2 ft. wide, in the wall next to the scale platform, five hinged windows in the rear wall and one hinged window in each end. Two doors are provided, one in each end, one of which opens directly upon a stairway leading down into the pit proper and also to a few steps up into the scale house.

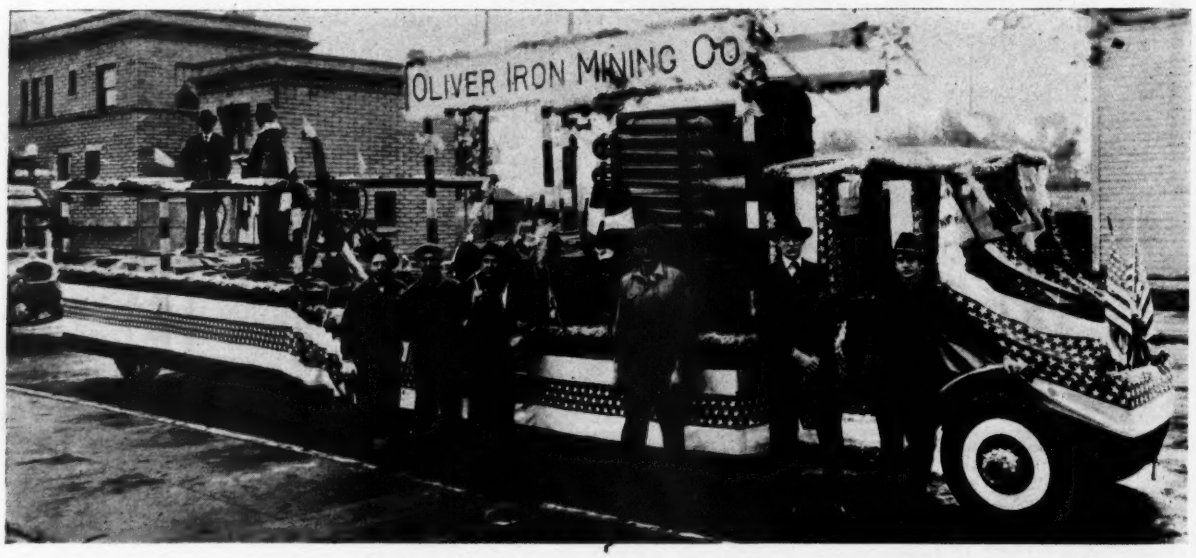
This arrangement has proved to be very advantageous in that it has permitted the weighman to secure a better view of the car numbers, etc., as he is now able to look down rather than up. In addition, considerable more light is admitted into the pit and the handling of the repair parts or replacements is made more easy by the increased accessibility of the pit.

Another feature of interest is the tapered platform, a patented device, which was designed to secure a watertight, properly drained platform and at the same time to provide proper ventilation for the scale pit. This floor is carried on tapered sections cut from 6-in. by 8-in. by 8-ft. pieces of timber so as to measure 6 in. wide when cut to size and to have a taper of ½ in. in 1 ft. for the full length.

These pieces are bolted to the stringers supporting the dead rail stands, one tapered section being placed on each side of the stand and notched to secure a full bearing surface on the stringer. Tongued and grooved 1⅝-in. planking is then laid lengthwise over these pieces and covered with two layers of 14-lb. tar felt. Another floor of the same material is laid crosswise upon this, after which it is covered with a flooring consisting of two layers of 14-lb. tar felt with a layer of unsaturated burlap between, and ¾ in. of mastic asphalt. All surfaces are thoroughly mopped with hot liquid asphalt as the platform surface is built up. All joints at the end and sides and around the dead rail stand are provided with galvanized iron flashings, carefully fitted and made watertight.

Effective ventilation is secured by making the live rail stands telescope in galvanized iron flashings fastened to the scale platform. Rain is prevented from beating in by having the upper edge of the live rail stand turn down so as to fit around and over the upper edge of the flashings when the scale was unloaded.

We are indebted for the above information to J. W. Orrock, principal assistant engineer of the Canadian Pacific, Montreal, Canada, under whose direction the design was developed.

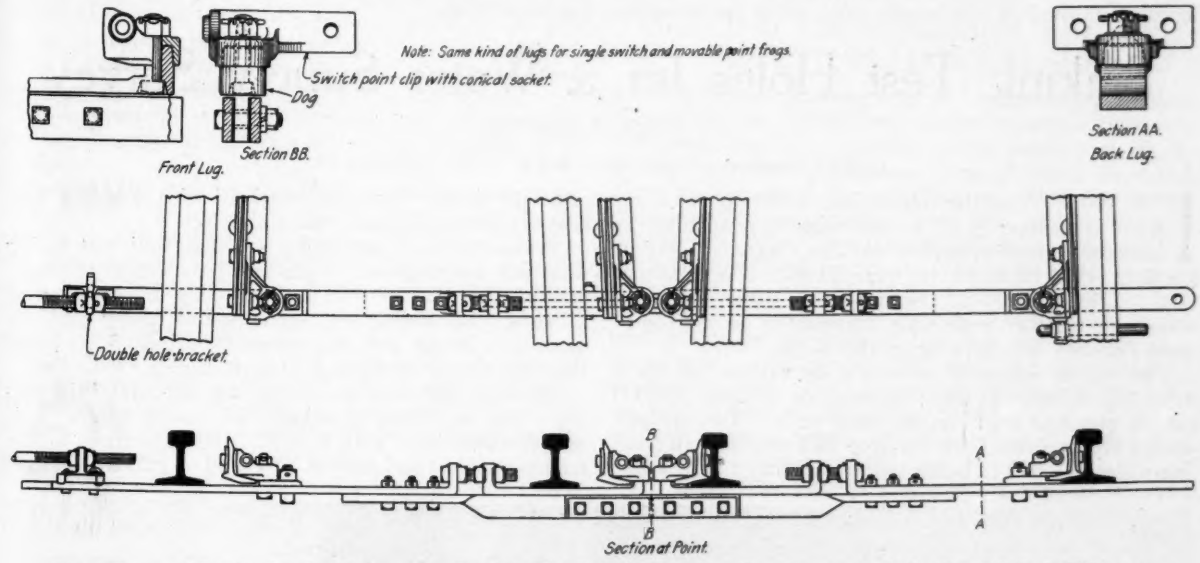


Track Work in a Fourth of July Parade

Float in Oliver Iron Mining Company's celebration at Hibbing, Minn., shows Imperial tie tamper in actual operation

SPECIAL SWITCH FITTNGS WITH CONICAL BEARINGS

EXCEPT WHERE space and speed of train movements are of paramount importance, as at large terminals, the use of slip switches and movable point frogs is generally avoided, since they introduce many movable points and a close spacing of rails, which interfere with the proper maintenance of track and require much closer attention to the adjustment of the interlocking apparatus. Because of this crowded condition and the fact that the points on double slips and movable frogs must operate in sets of four, the rods used to move and lock these points ordinarily require so much of the space between the ties that tamping is difficult, and for this reason it is frequently not so well done. This also introduces a problem in providing proper and accessible adjustment of the points so that the normal wearing of the parts due to movement and vibration is not unbalanced or excessive. The simultaneous moving of the four slip switch points and the four frog points increases the load so that special apparatus is sometimes provided at power interlocking plants, and the distance from the operating levers at mechanical plants must be short.



Part Plan and Section at the Points of a Double-Slip Switch Showing Arrangement of the Special Rod Fittings.

Rods Applied to One End of Double Slip Switch

In order to eliminate some of the objectionable maintenance and operating features associated with double slip switches and movable point frogs, J. C. Mock, signal and electrical engineer of the Michigan Central, designed a new set of switch fittings, shown in the illustrations, which are manufactured and sold by the W. W. Coleman Railway Supply Company, New York City. In this arrangement, the clips, which are bolted to the switch points, are attached to the switch rods by means of conical dogs. These are bolted or riveted to the switch rods, the clips having a conical recess on the under side to receive the convex cone on the end of the dog. The dogs and sockets are held in working relation to each other by means of bolts having castellated nuts to take up wear. The enlarged surfaces of the taper socket and cone, while greatly lengthening the life, provide an arrangement of parts that has all the characteristics of an enlarged taper pin connection. The operating and locking rods occupy no more space than is required on a single switch.

The parts consist of three pieces, as shown in the drawing, which are assembled by bolting together in the usual way. The middle piece is placed "edge-up," and, when required, is insulated in the middle to separate the points of each pair electrically. The design of this insulated joint follows closely the R. S. A. standard of insulated flat bars. The outside pieces are alike and "flat-up," thus providing a straight-line connection with a standard operating lock-rod attachment and a center line insulation throughout the entire slip and frog and a concentration of insulating material that can be inspected and renewed easily.

All the fittings can be made up in the factory for any angle of slip or frog. The only work to be done in the field is the drilling of holes in the ends of the center or spanner piece. Cotter pins are provided for all the nut and screw adjustments, instead of check nuts, to guard against loosening of the adjustments caused by vibration.

REDUCING EXPENDITURES FOR TOOLS AND SUPPLIES

AS A MEANS of interesting maintenance of way foremen in the materials and tools which they were using in their current work, the officers on the Scioto division of the Norfolk & Western adopted the practice several years ago of providing these employees with the unit costs of the various materials which they used and the total cost for each month. A list of practically all of the different kinds of tools and supplies used by maintenance of way men was prepared and furnished to all

foremen, together with the cost of each unit. These lists the foremen were required to keep at hand for ready reference at all times.

At the close of each month a statement was prepared showing all of the tools and supplies furnished to each gang, together with their total cost. A summary of this statement was then made and compared with the summary for the preceding six months. With this statement the officers were in a position to check closely the materials furnished by the supply cars, while the bringing of the cost of these tools and supplies to the attention of the foremen in this way led them to effect a material reduction in the amount of materials ordered. These statements were also used to create rivalry between gangs of similar character, the foremen endeavoring to keep their costs as low as possible in order to improve their showing. In addition, the officers made use of these statements to compare the amounts of the materials ordered by the different gangs of similar character before curtailing requisitions.

Sinking Test Holes for a Water Supply Survey

BY FRED D. YEATON

Assistant Engineer, Chicago, Milwaukee & St. Paul, Chicago, Ill.

IN A SURVEY of the sub-surface waters in the vicinity of Aberdeen, S. D., to determine its availability as locomotive water supplies for the Chicago, Milwaukee & St. Paul, 60 text holes were driven. The following is a detailed account of the manner in which the work was done, together with some information on the equipment required for carrying on this work.

The present supply of water for the railroad at Aberdeen, where there is a daily consumption of about 500,000 gal., is obtained from several deep wells. Two distinct waters are available from the deep well sources—an alkaline water at 1,000 ft. below the surface and a hard water at a depth of 1,200 ft. The latter contains such a large amount of incrustants that it is not suitable for boiler purposes and cannot readily be treated. Owing to the fact that the alkaline or soft water now being used leads to some difficulty when mixed with hard waters obtained from the adjacent water stations, and because of some apprehension as to the adequacy of the supply of this water, studies were made of the shallow water supply in the vicinity of Aberdeen, which led to the sinking of the test holes referred to above.

The holes were from 22 to 28 ft. in depth, the upper 10 ft. being usually dry loam and clay, the remainder being wet sand, gravel and quicksand with thin layers of hard, blue clay. Forty feet a day was a fair average under good conditions. The holes cost approximately 42 cents per foot. The crew consisted of a foreman, two laborers, recorder and a team and driver.

A four-inch post hole auger was used until wet caving sand was encountered. Then an 11-ft. section of three-inch pipe was driven with a sheet piling driver to act as a casing. By adding 4-ft. sections, this casing could be made any length and was generally driven 3 ft. lower than the bottom of the hole at each driving.

The next operation was to get the dirt out of the casing. This was done by using a 2-in. earth auger. This was screwed down with a 24-in. Stillson wrench; a man walking around and around. In sand or gravel the auger could be turned down about 1½ ft. at a time; in clay, ½ ft. was about the limit without twisting the rings on the auger. The auger was then pulled straight up and the dirt knocked out. In very wet sand or quicksand the two-inch auger could not be used except to stir up the material. On raising the auger the material would all run out. It was then necessary to use the sand pump. By raising and dropping this, the sand and water were forced in at the bottom and held there by the marble valve. When the pump was full it was pulled out and turned upside down, the material running out at the top.

Where quicksand was encountered, it was found best to keep the casing driven down, in order to shut out this sand as much as possible. When quicksand was encountered quite deep, the two-inch pipe was driven

Boring a Hole. A Four-Inch Auger. A Derrick Rig Pulling a Casing With Block and Chain

down to act as an inner casing, and the sand pump worked in this. This was not always satisfactory, as small stones, etc., became wedged between two-inch and three-inch pipes and made them hard to drive and pull.

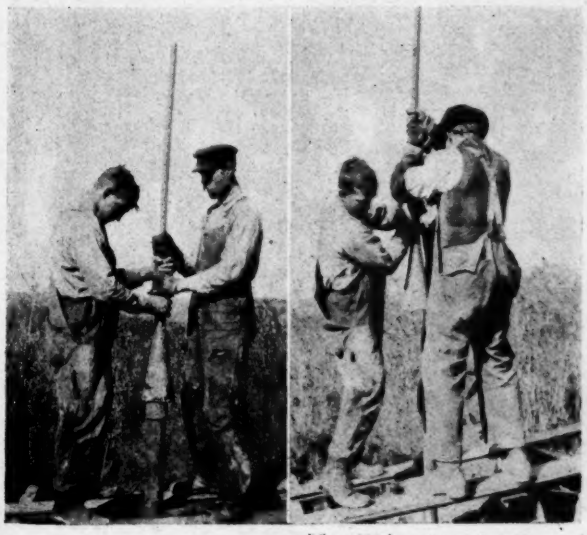
When nearing the bottom, a 1½-ft. section of one-inch pipe was screwed together, adjusted to the proper depth, and driven. Three or four feet was about the limit of this driving, and after that the material would pack so hard inside the pipe that it would not push up; the pipe acting as a solid rod. The pipe was then pulled out, the short sections unscrewed, and the kind of material found inside noted. This method of obtaining information could be only used on the last three or four feet, as after pulling the pipe the one-inch hole would immediately fill in again.

In removing the casing, a block and chain were used. Occasionally the block and tackle were used with the derrick to steady the longer sections of pipe. This was the case, however, only when the pipe was withdrawn from deep holes. The saw horses and planking were used to make a staging to stand on when starting to drive new sections of casing.

When using the team, the augers, a few sections of pipe, wrenches, etc., were loaded and immediately hauled to the new hole. Usually the men also rode. The teamster then returned alone, loaded the remaining equipment, and hauled it to the new hole.

The following is the equipment found necessary for a crew of one foreman and two laborers to sink test holes to the best advantage. The test holes did not exceed 30 ft. in depth. The material encountered was caving sand saturated with water.

1 80-lb. sheet piling driver.
1 16-lb. sledge hammer.
2 18-in. Stillson wrenches.
2 24-in. Stillson wrenches.
2 4-ft. lengths of ½-inch chain.
1 4-ft. Fenn post hole auger.
3 2-in. earth augers designed for clay.
1 2-in. spring tong auger for stones.
1 7-ft. 1½-in. marble valve sand pump (made of 1½-in. pipe).
1 25-ft. piece ½-in. rope for sand pump.
1 11-ft. piece 3-in. pipe.
5 4-in. pieces 3-in. pipe.
1 16-ft. piece 2-in. pipe.
1 5-ft. piece 2-in. pipe.
5 2-ft. pieces 2-in. pipe.
2 16-ft. pieces 1-in. pipe.
6 1½-ft. pieces 1-in. pipe.
1 6-in. piece 1-in. pipe.



How the Casings Were Driven

2 carpenter's saw horses 2 ft .high.
4 6-ft. pieces staging plank.
1 3-leg derrick 16 in. high (made of 2 by 6).
1 block and tackle.
1 4-ft. piece solid ¾-in. rod.

All pipe to be threaded on both sides and couplings to be provided.

If many holes are to be sunk and they are more than 500 ft. apart, a team is necessary to facilitate the moving.

GETTING THE FOREMAN AND HIS MEN TO PULL TOGETHER

IN ORDER to promote a better understanding between the foremen and the men under them and thus help themselves and the company at the same time, P. F. Solan, supervisor of buildings, Grand Central Terminal, New York Central, has compiled an interesting set of daily rules and suggestions. These rules, which were published in the New York Central Magazine, were not intended arbitrarily to govern the conduct of either the men or the foremen under Mr. Solan, but were offered by him solely as a set of suggestions which, if carried out, would tend to further the spirit of fair play and to promote a closer relationship between the men. An adaptation of these daily rules could be used advantageously throughout the railroads of the United States and, if offered in the same spirit of helpful co-operation, would do much to increase the efficiency of the men.

The suggestions issued to the foremen were as follows:

How the Foremen Can Help

Be fair, and have no favorites and no scapegoats.

A foreman has to act as a judge many times a day; therefore, he must be just.

Make few promises. Those that you make, keep. You must be exact in this particular. Many times the foreman forgets that his job requires a high standard of truth and honor.

Anger is a very valuable thing, but it should not be used carelessly.

Keep your forceful language for special occasions. Before a foreman can control others, he must control himself.

Always hear the other side. Never blame your man until he has been given a chance to give his point of view.

Don't hold spite. Forgive.

When you have to scold a man, go to him later in a friendly way.

Never show discouragement.

Never let yourself be beaten in your class of work. Always maintain a high standard.

Notice good work as well as bad, and mingle praise with blame.

Take a keen human interest in your men; notice them work; study them and put each one where he can do best.

Put the right spirit in your work, and take more interest as if you were doing it for yourself.

Don't always blame your men. Take full share of the blame. This is the most difficult of all.

A foreman who can share both blame and praise with his men will have discovered the secret of managing his men.

I want you to ask yourself if you think you are worth more to yourself today than you were six months ago.

A good foreman must always be a good worker. His whole aim should be to encourage his men to increase capacity and enlarge output and to add to their ability and value.

The list issued to the men was as follows:

How the Men Can Help

Greater production depends on the individual.

Every man should ask the personal question, "Am I producing my share?" If you cannot answer "Yes," then something is wrong with you, and you must correct it.

No matter how small your task, or of how little importance your endeavors, it is your duty to make the most of them, and to give the greatest service you can.

A soldier is trained for battle; also the prizefighter trains and fits himself to strike his hardest blow.

The workers, and we should all be workers, should aim to increase capacity, enlarge output, and add to ability and value.

Every sound business man once in so often takes account of his stock, thus finding out accurately what it is, and how profitably he can use it.

It would be a fine thing, and a wise thing, for everybody to follow his example.

Are you worth more to yourself and to your employer than you were six months ago? If you are not you are cheating yourself as much, or more, than you are cheating him.

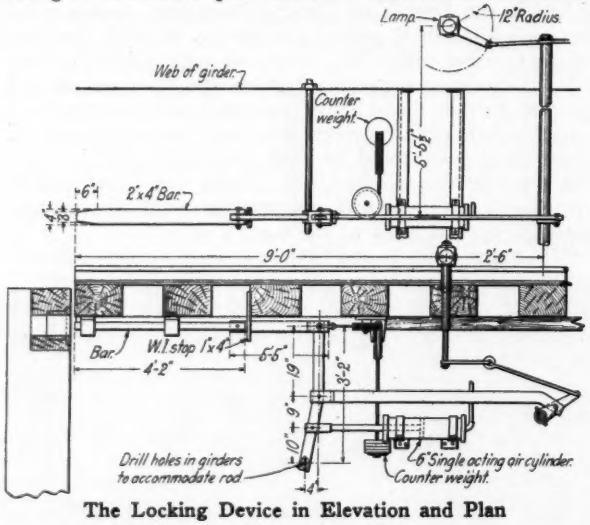
You are not producing as much now as you were one year ago. Therefore you are cheating yourself and your family, as well as your employer.

Any man who says, "No, I cannot produce more," is not to be blamed. I sympathize with him, and will be glad to help him to get out of that rut.

A SIMPLE AIR-OPERATED TURNTABLE LOCK

By Norman McCleod

IT FREQUENTLY happens that locomotives not only take a notion to go through the outer wall of a roundhouse, but probably as often decide to stray from the straight and narrow path and take a header into the turntable pit owing to the absence of, or the failure of, the locking device to keep the tracks on the table in line with those radiating from the engine house. To prevent such occurrences, a pneumatic locking device has been designed and is now in successful operation on a number of turntables on one of the large eastern railroads. This enables the operator of the tractor (if the table is provided with one) to cause a 2-in. by 4-in. bar to be pushed into any one of a series of cast-iron receptacles, one of which is located in the turntable pit wall in the center of each track radiating from the engine house.



The Locking Device in Elevation and Plan

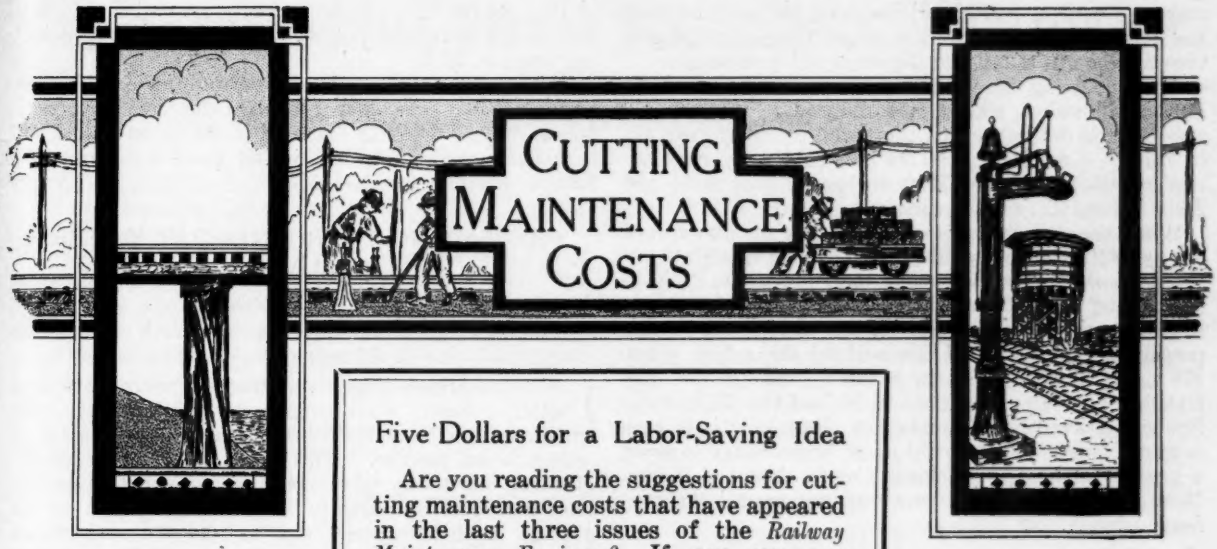
The lock cylinder is 6 in. in diameter, single-acting, the release or return of the bar or lock being accomplished by a counterweight immediately upon the release of the air in the cylinder by the operator. Simultaneously with the movement of the locking device two standard switch lamps are made to revolve 90 deg. by a system of cranks and levers so that these lamps display alternately red or white lights, as the case may be, white indicating that the table is locked and the red indicating danger or that the table is unlocked.

K. C. S. ORGANIZES MAINTENANCE OF WAY ASSOCIATION

THE KANSAS CITY SOUTHERN now has its own maintenance of way association, which was organized on July 12 for the purpose of obtaining a closer contact between the individual members of the maintenance of way department on that road as well as to afford a means of mutual helpfulness in the conduct of the work. This association is known as the Kansas City Southern Maintenance of Way Association and its membership consists of employees of the maintenance of way and engineering department, from the ranks of rodman or foreman, respectively, up, whose applications for membership have been favorably acted upon. Membership on the part of employees is entirely optional. The management of the association is in the hands of an executive committee consisting of J. M. Wier, chief engineer of the railroad, as chairman, and the division engineers and superintendents of bridges and buildings and the superintendent of telegraph. There is also a secretary to be appointed by the chairman.

For purposes of holding meetings the association has been divided into a northern and a southern group. The northern division holds its meetings on the last Monday before the last Wednesday of the month and the southern division on the last Wednesday of the month at places designated by the chairman.

A Meeting of Kansas City Southern Maintenance of Way Men



Five Dollars for a Labor-Saving Idea

Are you reading the suggestions for cutting maintenance costs that have appeared in the last three issues of the *Railway Maintenance Engineer?* If you are, are you learning anything from the suggestions made? Perhaps the methods proposed recall to mind labor-saving kinks which you have put into practice and which you believe to be superior. If they have helped you, you can be sure that they will help others. If you have developed any labor-saving device, any supplementary use for equipment other than that for which it was intended or any other plan for saving labor, the *Railway Maintenance Engineer* desires an opportunity to publish an account of it. We will pay $5 for each meritorious idea or description of this character which is not generally known or used and which has not been described previously in these columns or elsewhere. Send such contributions to the editor, 608 South Dearborn street, Chicago.

HOW TO SPIKE A GUARD RAIL

By E. E. Boyer

Roadmaster, Missouri Pacific, De Soto, Mo.

In these days of large rail sections and guard rail clamps, the kink described below may not be as generally applicable as formerly, but in yards and side tracks that are still maintained with light rail it will serve very well. In setting a guard rail which is held in place only with spikes and braces, the spikes driven between the two rails and which engage the guard rail are usually driven after the face spikes and braces have been applied. While this method gives an expert with a spike maul a chance to "show off" by striking with the small end of his maul through the 1¾-in. space between the rail heads, the spiking is certain to be poor, as the spike is "heeled back" and driven under the guard rail.

My plan is to set all the spikes which engage the tangent part of the guard rail with their backs against the main rail and drive them down to within one-half inch of the top of the tie, then shove the guard rail out under the heads, place a punch on top of spike heads and give them one tap each.

SAVING TIME IN LAYING SWITCHES

By William Marnoch

Yard Foreman, Atchison, Topeka & Santa Fe, Needles, Calif.

IN RELAYING rail through switches it is very important to have the material for the switches as nearly ready to be placed in the track as possible before the gang comes up to the switch. By figuring carefully all cutting, boring and bending of the rails may be done well in advance of the regular steel gang so that the gang will not be delayed when it reaches this point. As illustrating the simplicity of such a procedure, I taught two Mexicans how to do the necessary measuring, cutting and boring for a No. 10 switch in less than an hour's time, so that these men prepared all of the rails for 45 switches during the ensuing summer with only one slight mistake.

While the following information refers to a Santa Fe standard No. 10 switch, the method is equally applicable to any other number or style of switch. This switch requires eight 33-ft. rails, one 33-ft. rail cut in half and two 24-ft. rails. The distance from the first joint ahead of the switch point to the heel of the frog is 99 ft. or equal to three 33-ft. rails. The distance from the switch point to the first joint ahead of the point is 9 ft. 10 in. I measure this distance on a 33-ft. rail and from this point measure 16 ft. 6 in. (the length of the switch point), which latter point will be the center of the filler block at the heel of the switch point. I then mark the center of the angle bar which is to be used on the heel filler joint and place this bar in position on the rail with the mark on it in line with the mark on the rail indicating the heel of the switch point. The holes in the angle bar will then come on the rail at the points which should be bored for the filler block at the heel of the switch. These holes may be bored and the switch point connected to the rail with the heel filler block in position, the point of the switch rail being held in place temporarily with a piece of wire so that the tong men may set the point and switch rail at one operation. Using the same measurements, the stock rail on the opposite side of the track may be bent the desired number of inches ahead of the switch point.

The guard rails are likewise connected to 33-ft. rails, the center of the guard rail being 10 in. in advance of the frog point. To ascertain the location of the guard rail holes, one may measure 6 ft. 1 in. from the end of the 33-ft. rail which will give the location of the first hole. From this point to the second hole is 7 ft. 3 in. The guard rails

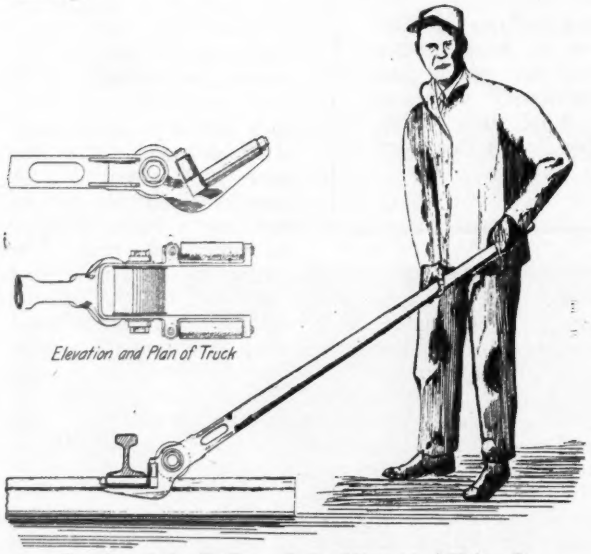
may be placed in position on the main rail and the bolts and clamps tightened until the proper flangeway distance between the guard rail and the main rail is secured.

The men doing this work may also be taught readily to lay out all switch slide plates and rods. They should also be required to see that the necessary short rails are on hand. If no 24-ft. rails are obtainable, any combination of rails aggregating 57 ft. in length, such as 31 and 26 or 30 and 27, may be used.

When the rail gang comes within five or six rails of the switch, the gang should be stopped long enough to enable a measurement to be made from the last rail laid to the starting point of the switch. The foreman of the gang should have a list of the short rails on hand so that he can prepare a combination which will fill the unlaid space. For instance, if this distance is 126 ft., the foreman may find that he has on hand two 31-ft. and two 32-ft. rails. By having available a number of short rails it is easy to fill this space and it should never be necessary to move a switch forward or backward more than six inches. More frequently this distance will not exceed three or four inches.

A RAIL HANDLING DOLLY

A TRUCK or dolly has been developed which has demonstrated its advantages in handling rails on skids at storage yards, resaw plants, loading or unloading docks, etc. This device is intended for use with the skids as now generally used, but makes the work so much easier that two men, one at each end of the rail, can handle rails with ease, whereas a much larger number (depending upon the slope of the skids) is required with the ordinary method of sliding the rails on the greased skids. Moreover, the new device eliminates the grease entirely.



Details of the Dolly and the Manner of Using It

As shown in the illustration, it consists of a roller five inches in diameter fitted by means of ball bearings in a frame that is attached to a five-foot hard maple handle. The roller frame has two projections arranged to extend down on either side of the skid on which the roller is operating and affording a seat for the rail which is to be moved. When the handle is held properly the base of the rail will be slightly above the surface of the skid. It is to be noted that these extensions of the frame are equipped with smaller rollers to facilitate the movement of the rail longitudinally while supported by the dolly so that the rail pile may be properly squared up by sliding the rail endwise. The weight of this device in working order is 30 lb.

This truck is used for handling rails with considerable savings by the stores department of the Great Northern and at the rail docks at the head of the Great Lakes. It is manufactured by the Leahy Rail Truck Company, 533 Endicot building, St. Paul, Minn.

PREVENTING TIE BURNING AT WATER COLUMNS

BY GEO. T. DONAHUE
Assistant Supervisor of Track, New York Central, Rochester, N. Y.

IT IS AN acknowledged fact that wherever there is a water column, some enginemen cannot resist the temptation to dump their fires, although there may be orders to the contrary. This is not practiced by all enginemen, but it only takes one dumping of hot cinders to burn through from three to seven or eight ties. On the average subdivision there are, say, twelve such water columns and in the course of a year it will be necessary to replace five ties at each plug. This cost in material and labor is well worth saving.

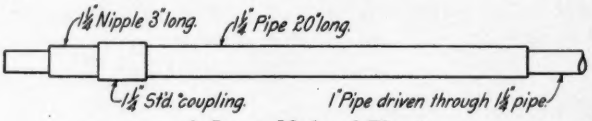
Around the car shops the supervisor can secure some old iron aprons about 42 in. wide and 6 ft. long which have been discarded from crippled cars. By placing a couple of these over the ties at each water plug where he is having burnt ties he will overcome this trouble.

A HOME MADE JACK LEVER

BY C. S. LUSK
Section Foreman, Erie Railroad, Alfred Station, N. Y.

THE TENDENCY to use lining bars for track jack levers in the past few years, because wood levers do not stand the work, has added an extra burden to the heaviest implement used in track work. The lining bar will not fit unless a special socket is provided. To move a jack and lining bar from one point to another is a two-man job, while a wooden lever can be moved along with jack by one man. Some advocate the use of a lining bar so that it can be used for holding up ties, but it is better to keep it with the jack for immediate use when a train approaches.

A study of the jack lever problem led to the construction of two levers like the one shown in the sketch. The



A Lever Made of Pipe

total length is 4 ft. 6 in. and a man of ordinary height can raise it to its highest point of travel 6 ft. 6 in. Our lining bars weigh 22 lb. each, while this jack lever weighs but 12 lb., and the load being mostly at the lower end or where it goes into the socket, makes it convenient to handle.

The lever is made from a 4-ft. 6-in. piece of 1-in. pipe, a 20-in. piece of 1¼-in. pipe and a standard coupling to connect the 1¼-in. pipe in the manner shown in the sketch. When all is completely assembled a hard wooden plug was driven in each end of the 1-in. pipe. The lever has three points to bearing in socket and will not slip. The 1-in. pipe will fit close inside of 1¼-in. pipe, but by squeezing it in a vise the larger pipe is kinked enough to keep it from slipping after it was adjusted to fit the jack socket.

ROADMASTERS HOLD SUCCESSFUL MEETING

Convention at St. Louis Characterized by Large Attendance, Good Program and Active Discussion

THE THIRTY-EIGHTH annual convention of the Roadmasters and Maintenance of Way Association which was held at the Statler hotel, St. Louis, Mo., on September 21-23 inclusive, was one of the most successful in the history of that organization. Over 700 roadmasters and higher maintenance officers from all parts of the United States and Canada were in attendance. Keen interest was displayed in the reports, papers and discussions, all of which were of a more than usually practical character.

On Tuesday evening the members of the St. Louis Railway Club were the guests of the Roadmasters' Association, at which time Col. F. G. Jonah, chief engineer of the St. Louis-San Francisco and president of the St. Louis Railway Club, presented a paper on "Methods of Increasing the Efficiency of Maintenance of Way Forces," after which a moving picture film entitled "The Americanization of Tony," prepared by the Pennsylvania Railroad as a means of educating its track employees in efficient and safe methods, was presented. On Thursday evening, following the conclusion of the convention, the roadmasters were the guests of the Railway Club when J. B. Strong, vice-president of the Ramapo Iron Works and chairman of the Standardization Committee of the Manganese Track Society, Hillburn, N. Y., read a paper on "Manganese Construction in Track Work" and Earl Stimson, chief engineer maintenance of way, Baltimore & Ohio System, Baltimore, presented a paper on "Methods of Standardizing Track Work."

The officers of the Roadmaster's Association during the past year were: President, J. W. Powers, supervisor, New York Central, Rochester, New York; first vice-president, W. P. Wiltsee, principal assistant engineer, Norfolk & Western, Roanoke, Va.; second vice-president, L. M. Denney, supervisor, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.; secretary, P. J. McAndrews, roadmaster, Chicago & Northwestern, Sterling, Ill.; treasurer, Coleman King, supervisor, Long Island Railroad, Jamaica, N. Y.

Opening Exercises

The convention was called to order at 10 a. m. on Tuesday by J. W. Powers, president. Colonel Jonah welcomed the association to St. Louis in behalf of the St. Louis Railway Club and the railways of that city. In the course of his remarks he traced the early pioneer development period through which the railways have passed to that of more permanent construction. He contrasted the standards on French railways with those of this country, pointing out the permanent manner in which the European roads are built. He stated that there was not a single wooden railroad bridge in France, nor are there any wooden buildings near the tracks, the bridges, stations, shops, water tanks and other structures being of stone. There is not a mile of French railway line which is not ballasted with stone, while tracks are laid on creosoted ties, with screw spikes. Grade crossings are practically all eliminated and the few remaining ones are protected by heavy gates which are normally closed to highway traffic. All side ditches are paved with stone, as are all slopes of cuts showing a tendency to slide. With the outlook for more liberal expenditures for maintenance, he urged the roadmasters of America to work towards these permanent standards of the French railways.

In supplementing Colonel Jonah's welcome, H. J. Pfeifer, chief engineer of the Terminal Railroad of St. Louis, outlined the problems now facing the roads and emphasized the opportunity which the roadmasters now have to restore their roads to their proper condition. He dwelt upon the necessity of rehabilitating the tracks if they are to continue to handle the traffic properly.

The Track Man—A Tribute

They are out in the severest weather, the unmerciful wind cutting their brown faces. The broken rail is replaced many times when only they know of the services they have rendered. Patrolling their divisions at night when the earth is veiled in darkness, when the heavens appear to have determined to again flood the earth, their bodies covered with wet clothing, they cannot return to more comfortable quarters, for there may be a treacherous washout ahead. It is discovered; the coming train is flagged, the track repaired, but their heroic conduct is unheralded, unknown.—*From the address of President Burnett at the first convention of the Roadmasters' Association, 1883.*

President's Address

In his opening address, President Powers stated that we are living in a day when the community of workers is being constantly and aggressively forwarded and thus we are living in an age of associations and conventions. This means that we are making collections of knowledge not on an isolated plan but on one of broad interests. The members of this association perform their duties to the best of their ability and through hard work and honest endeavor, conquer many obstacles during a season's work, and then come from widely separated parts of this continent and join in this great gathering each year that knowledge which each one has gained is made common to all.

With the many important problems now confronting the maintenance of way department during the period of reconstruction, there is a demand for all of the constructive work and knowledge that it is possible to secure and no association has a more important field for study and the exchange of ideas than ours. The average supervisor or roadmaster is responsible for the proper expenditure for labor and material of from $100,000 to $600,000 annually. It is to study the best methods of doing work in which these large sums are expended, that the members of this organization are devoting their time.

There is a wide field for us to work in the investiga-

tion of economical maintenance methods and proper organization in our department and it is along these lines that the greatest opportunity for study by our members should be found. You are urged, therefore, to give the association the benefit of the very fullest discussion and interchange of thought here today. We want results now for this convention. We want them, not only for the benefit of those present and the roads they represent, but also the members absent, for the men who are successful are those who are equipped with knowledge, advanced ideas and better methods. The attendance at a convention is regarded as seriously by most men as any other work of investigation on behalf of the companies they represent.

REPORT—ECONOMIC WEIGHTS OF RAILS

AS A general proposition, when a heavier rail will last enough longer to make its ultimate cost per year less than the cost of a lighter section of rail, it is economical. From a viewpoint that considers only the annual labor cost of rail maintenance, this expense will become less as the section of rail is made heavier, less track labor being required to install and maintain the heavier rail under nearly all conditions. In a few cases, it may happen that the saving is very small, but, as a general statement, it may be said that the installation of a heavier section of rail will conserve track labor. There is also a rather special case where a very heavy rail may be economical but for reasons entirely apart from traffic. This occurs under conditions where a heavy section rail will give practically infinite life and at the same time make possible a very low annual labor charge for maintenance, the very strong rail section holding the track to line and surface with practically no attention.

The various elements which enter into the annual cost of rail maintenance are: (1)—First cost of rail in track—to be stated in terms of an annual charge which, allowing interest at 6 per cent compounded annually, will be sufficient to yield the original cost of the rail in track at the expiration of the life of the rail whatever may be its life. This first cost of rail in track is determined from the cost of the rail new, cost of the delivery to the work, laying the new rail, removal and disposition of the old rail, and the salvage value of the rail removed. (2 a) Interest at 6 per cent on the first cost of the rail in track; (b) taxes at 1 per cent on the first cost of rail in track. (3) Interest at 6 per cent and taxes at 1 per cent on such scrap value as the rail in track will have when taken up. The rail when removed from track will have a certain scrap value, which value, due to the fact that we have a scrap credit in arriving at the first cost in track, must be considered as a carrying charge to be borne by the railroad company, and involves interest at 6 per cent and taxes at 1 per cent on the scrap value when the rail is removed. In the tabulations following, these three elements of cost have been grouped as "Annual Charge Based on Life of Rail." This annual charge develops the variations in costs of maintaining rail of various weights of sections which are due to different length of life of rail. (4) The annual labor cost of maintaining rail of various sections in one mile of track, under like conditions of traffic, subgrade, ballast, ties and tie plating, and represents the variation in cost of track maintenance due to different weights of rail sections.

ANNUAL COST OF MAINTENANCE OF RAIL PER MILE OF TRACK

Cost of New Rail, $43 per ton. Cost of installation, including cost taking up and disposing of old rail, $20 per ton. Salvage value of rail removed, $18 per ton. Net Cost in track, $43 per ton.

Life of Rail in Years.	Item 1—First Cost of Rail in terms of annual charge at 6% compound interest, which will yield original cost of rail in time, i. e., $43 per ton at expiration of life of rail.	Items 2a and 2b—Interest at 6% and tax at 1% on $43 per ton, i. e., annual interest and taxes on value of rail in track.	Item 3—Interest at 6% and taxes at 1% on $18 per ton, i. e., annual carrying charge to railroad at scrap value of rail in track.	Annual charge per ton—sum of Items 1, 2a and 2b, and 3.	85-LB. RAIL				100-LB. RAIL				130-LB. RAIL			
					Tons of rail per mile of track.	Total annual charge per mile of track.	Item 4—Annual labor cost maintaining 85-lb. rail per mile of track.	Annual cost of maintenance per mile of track, 85-lb. rail.	Tons of rail per mile of track.	Total annual charge per mile of track.	Item 4—Annual labor cost maintaining 100-lb. rail per mile of track.	Annual cost of maintenance per mile of track, 100-lb. rail.	Tons of rail per mile of track.	Total annual charge per mile of track.	Item 4—Annual labor cost maintaining 130-lb. rail per mile of track.	Annual cost of maintenance per mile of track, 130-lb. rail.
1	$40.566	$3.01	$1.26	$44.836	133.57	$5989	$135	$6124	157.14	$7046	$114	$7160	204.29	$9160	$86	$9246
2	19.629	3.01	1.26	23.899	133.57	3192	135	3327	157.14	3755	114	3869	204.29	4882	86	4968
3	12.743	3.01	1.26	17.013	133.57	2272	135	2407	157.14	2673	114	2787	204.29	3476	86	3562
4	9.255	3.01	1.26	13.525	133.57	1807	135	1942	157.14	2125	114	2239	204.29	2763	85	2849
5	7.202	3.01	1.26	11.472	133.57	1532	135	1667	157.14	1803	114	1917	204.29	2344	86	2430
6	5.809	3.01	1.26	10.079	133.57	1346	135	1481	157.14	1584	114	1698	204.29	2059	86	2145
7	4.829	3.01	1.26	9.099	133.57	1215	135	1340	157.14	1430	114	1544	204.29	1859	86	1945
8	4.098	3.01	1.26	8.368	133.57	1118	135	1253	157.14	1315	114	1429	204.29	1710	86	1796
9	3.527	3.01	1.26	7.797	133.57	1041	135	1176	157.14	1225	114	1339	204.29	1593	86	1679
10	3.077	3.01	1.26	7.347	133.57	981	135	1116	157.14	1155	114	1269	204.29	1501	86	1587
11	2.707	3.01	1.26	6.977	133.57	932	135	1067	157.14	1096	114	1210	204.29	1425	86	1511
12	2.405	3.01	1.26	6.675	133.57	892	135	1027	157.14	1049	114	1163	204.29	1364	86	1450
13	2.148	3.01	1.26	6.418	133.57	857	135	992	157.14	1009	114	1123	204.29	1311	86	1397
14	1.930	3.01	1.26	6.200	133.57	828	135	963	157.14	974	114	1088	204.29	1267	86	1353
15	1.743	3.01	1.26	6.013	133.57	803	135	938	157.14	945	114	1059	204.29	1228	86	1314
16	1.579	3.01	1.26	5.849	133.57	781	135	916	157.14	919	114	1033	204.29	1195	86	1281
17	1.438	3.01	1.26	5.708	133.57	762	135	897	157.14	897	114	1011	204.29	1166	86	1252
18	1.312	3.01	1.26	5.582	133.57	746	135	881	157.14	877	114	991	204.29	1140	86	1226
19	1.201	3.01	1.26	5.471	133.57	731	135	866	157.14	860	114	974	204.29	1118	86	1204
20	1.102	3.01	1.26	5.372	133.57	718	135	853	157.14	844	114	958	204.29	1097	86	1183
21	1.014	3.01	1.26	5.284	133.57	706	135	841	157.14	830	114	944	204.29	1079	86	1165
22	0.935	3.01	1.26	5.205	133.57	695	135	830	157.14	818	114	932	204.29	1063	86	1149
23	0.863	3.01	1.26	5.133	133.57	684	135	819	157.14	807	114	921	204.29	1049	86	1135
24	0.798	3.01	1.26	5.068	133.57	677	135	812	157.14	796	114	910	204.29	1035	86	1121
25	0.739	3.01	1.26	5.009	133.57	669	135	804	157.14	787	114	901	204.29	1023	86	1109
26	0.685	3.01	1.26	4.955	133.57	662	135	797	157.14	779	114	893	204.29	1012	86	1098
28	0.592	3.01	1.26	4.862	133.57	649	135	784	157.14	764	114	878	204.29	993	86	1079
30	0.513	3.01	1.26	4.783	133.57	639	135	774	157.14	752	114	866	204.29	977	86	1063
32	0.446	3.01	1.26	4.716	133.57	630	135	765	157.14	741	114	855	204.29	963	86	1049
33	0.417	3.01	1.26	4.687	133.57	626	135	761	157.14	737	114	851	204.29	958	86	1044

Such a figure as this must, of course, be determined right on the ground and the values assigned here are based on the records and observations made on selected stretches of track, some miles of selected stretches of track having been under observation for a period of one year, supplemented by such other data as could be obtained.

There is one detail in connection with the cost of rail maintenance which we desire to mention, and that is the relative costs of laying heavy section rail and light section rail. Our investigation of this phase of the subject developed that the experience of one railroad now using very heavy rail is that due to the fact that all rail is laid with locomotive cranes, the heavy rail is laid as easily as 56-lb. rail and that the labor costs in laying the heavy rail is not more than for laying the lighter sections. We do not have figures on relative total costs, i. e., labor and machines, but our observations lead us to the conclusion that the adoption of a heavier section rail is usually reflected in increased cost of installation, and that in the course of time the gang organization gradually gets on a basis of the heavy rail. The result is that the general level of rail installation costs are apt to be raised by the general use of heavier section of rail and we have considered the cost of installation to be a flat rate per ton, the difference in tons of rail of various sections per mile of track indicating the effect of the heavy rail on the costs of installation.

With this study of the elements involved, we have developed the annual cost of maintaining rail of various weights of sections, per mile of track, which cost includes interest, taxes, depreciation and labor, and, as already stated, is determined on basis of the life of rail.

The following tabulations show in detail this annual cost of rail maintenance for 85-lb., 100-lb., and 130-lb. rail. The details of costs used in arriving at the annual cost of rail maintenance for 85-lb., 100-lb., and 130-lb. rail. The details of costs used in arriving at the annual cost of rail maintenance are shown with each tabulation, but for convenience, we state these units here. The costs refer particularly to the latter part of 1918 and the early part of 1919, and are as follows:

Cost per ton of new rail	$ 41.00
Cost to lay new rail, including delivery to work, removing and disposing of old rail; per ton	20.00
Salvage value of old rail; per ton, full tonnage allowed	18.00
Net cost per ton of new rail in track	43.00
Average labor cost of rail maintenance per mile of track per year, 85-lb. new rail; labor at 40 cents per hour	135.00
100-lb. new rail	114.00
130-lb. new rail	86.00
Tons of rail per mile of track, 85-lb.	133.57
Tons of rail per mile of track, 100-lb.	157.14
Tons of rail per mile of track, 130-lb.	204.29

The details of arriving at the annual maintenance cost of 130-lb. rail are as follows—and we will consider the annual maintenance cost when the average life of rail is 10 years.

The first cost of rail in track is stated in terms of an annual charge, which, allowing interest at 6 per cent compounded annually, will be sufficient to yield the original cost of the rail in track at the expiration of the life of the rail, which in this case is 10 years.

1. This annual charge at $43 per ton is		$ 3.077
2. (a) Interest on first cost in track at six per cent on $43	2.58	
(b) Taxes on first cost in track at 1 per cent on $46	.43	3.010
3. Interest at 6 per cent and taxes at 1 per cent (total 7 per cent) on $18 salvage value per ton of rail when removed		1.260
First cost (10 yr. life) per ton		7.347
Tons of rail per mile of track (130-lb. rail)		204.29
Annual charge per mile of track based on 10-yr. life of 130-lb. rail		1,501.000
Annual cost (labor 40 cents per hr.) of maintaining 130-lb. rail in one mile track		86.000
Annual cost of maintenance—including interest, taxes, depreciation and labor		1,587.000

J. W. Powers,
President

Considering the data in the tables, the annual cost of maintenance of one mile of track laid with 85-lb. rail, one mile laid with 100-lb. rail and one mile laid with 130-lb. rail, assuming the rail in each section to have a life of 10 years, is as follows:

Weight of rail	Av. life of rail	Annual cost of main. per mile of track
85-lb	10 years	$1,116
100-lb.	10 years	1,269
130-lb.	10 years	1,587

This is merely an illustration of relative annual costs of maintenance per mile of track, assuming that conditions affecting rails to be such that 85-lb. rail on one stretch has the same life as 100-lb. rail on another stretch and 130-lb. rail on a third stretch of track.

Now consider the life of various weights of rail which would result in an equal annual maintenance cost per mile of track—this information can be taken readily by interpolating from the large table. For example, take the annual maintenance cost to be $1,400, then the

Average life of 85-lb. rail is	6.55 years
Average life of 100-lb. rail is	8.25 years
Average life of 130-lb. rail is	12.85 years

The next problem is to determine the relative life of the various sections of rail under similar conditions of traffic. Such a problem may apply to the relative life of rail for an entire railroad, for a division or for merely a stretch of track. The results which were obtained for use in this report are based as far as possible on actual data, supplemented to such extent as was necessary by individual observations and conclusions. The units here used are fairly representative of conditions involving on one extreme—tracks in which the life of, say, 100-lb. open hearth rail—is approximately four months, and to the other extreme where the life of this same rail is practically indefinite, the average life of such rail in all main tracks being from 15 to 16 years.

It is essential that the relative life of rails of different weights of section be determined for each railroad or division, as the case may be, as closely as possible, based on available data. The conclusions of the committee in the cases under discussion are—that under similar conditions of traffic, the life of 100-lb. rail is 1¼ times the

life of 85-lb. rail, and that the life of 130-lb. rail is double the life of 100-lb. rail. The relative life of over 100,000 tons of 130-lb. rail compared to the life of 100-lb. rail in same track was actually determined, based on four years' experience with the heavy rail, during which time over 4,300 tons of heavy rail were actually removed from tracks on account of being worn out. The result of this four years' experience with the heavy section rail indicated an average life 2.6 times as long as 100-lb. rail.

To allow for the comparatively short period of time for which the data concerning heavy sections was taken, the relationship between the average life of heavy section rail and 100-lb. rail was taken to be 2:1. The data concerning the relative life of 100-lb. and 85-lb. rail was of a more extended and broader nature, but had not been kept in as detailed a manner.

On this basis of relative life of 85-lb., 100-lb., and 130-lb. rail, under similar conditions of traffic, Fig. 1 was prepared, which shows the total annual cost of maintenance for the three weights of rail as taken from the table and, in addition, shows lines representing the life of various sections of rails under similar conditions of traffic, from which can be determined the difference in annual cost of maintenance due to different rail sections —for example, suppose 85-lb. rail gave a life of two years—the average maintenance cost is $3,327—then 100-lb. rail should give a life of 3½ years, with an average maintenance cost of $2,490, while 130-lb. rail should give a life of 7 years with an average maintenance cost of but $1,945. This is clearly a case where heavy section rail could be used economically from a maintenance point of view. Also consider conditions under which the average life of 85-lb. rail is 9 years and the average maintenance cost per mile track is $1,176. Then 100-lb. rail

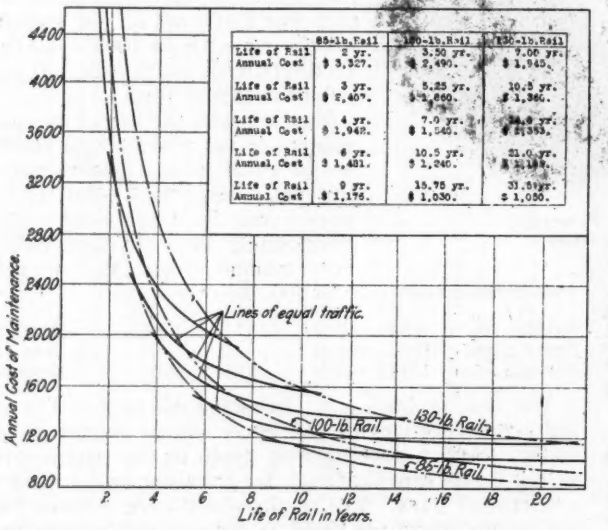


Fig. 1. Total Annual Maintenance Cost for Three Weights of Rail

should give a life of 15¾ years at an average maintenance cost of $1,030 per mile track, a saving per mile of track per year of $146. The 130-lb. rail should give a life of 31½ years at an average maintenance cost of $1,050, which is $20 per mile of track per year more than the 100-lb. rail should cost. This is a case where the economical rail is the 100-lb. section.

There remains the problem of developing a measure for wear of rail based on various conditions of traffic. To accomplish this, it is first necessary to fix some unit of traffic which will readily adapt itself to such a problem and which also can readily be determined under conditions of actual operation and the number of cars per day passing over a stretch of track was selected as the measure of traffic conditions. Such a unit closely reflects the locomotive tons and gross tons; the average weight of cars, average cars per train and average locomotive miles per train mile, ordinarily varying between narrow limits from month to month. Also the average number of cars passing a particular point over a stretch of track during any period can be readily determined at any time without elaborate machinery or organization.

To determine the proper life to assign to 100-lb. rail under various traffic conditions, stretches of track were

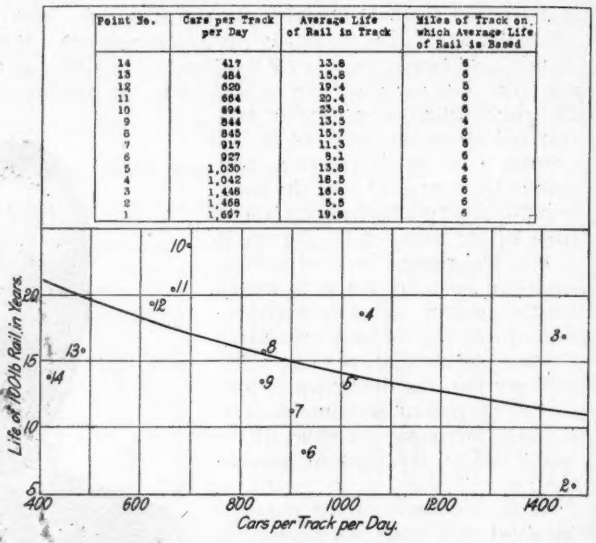

Point No. | Cars per Track per Day | Average Life of Rail in Track | Miles of Track on which Average Life of Rail is Based
14 417 13.8 6
13 484 15.8 6
12 626 19.4 6
11 664 20.4 6
10 694 23.8 6
9 844 13.5 4
8 845 15.7 6
7 917 11.3 6
6 927 9.1 6
5 1,030 13.8 4
4 1,042 18.5 6
3 1,446 16.8 6
2 1,466 8.5 6
1 1,697 19.8 6
Life of 100-lb Rail in Years.
Cars per Track per Day.

Fig. 2. Variation in Life of 100-lb. Rail According to Density of Traffic

selected for which information was available as to the average number of cars per track passing each point, and, in addition, there was also available a record of the rail in these stretches of track from year to year at each of these 14 points. The history of the rail on these stretches of track, each one about six miles long, was investigated and the average life of 100-lb. rail in each stretch of track determined. The traffic varied from 417 cars per track per day to 1,697 cars per track per day. These data were listed and plotted on Fig. 2 and a curve drawn which represents the variation in life of 100-lb. rail in years according to the number of cars per track per day.

With this as a basis, together with the data relative to annual cost of maintenance for 100-lb. rail in the table, the following information relative to the annual cost of maintenance for 100-lb. rail under various conditions of traffic was obtained.

From Fig. 2	From the large table
Cars per day	Average life of rail	Annual cost of maintenance
1600	10.3	$1,250
1400	11.4	1,200
1200	12.75	1,140
1000	14.1	1,090
800	15.9	1,040
600	18.4	990
400	21.1	940

The annual cost of maintenance of 130-lb. rail under various conditions of traffic was based on the relative life of 130-lb. rail being double that of 100-lb. rail, and, for 85-lb. rail, the relationship of 85-lb. to 100-lb., 1 to 1¾, and the annual cost of maintenance for 130-lb. rail and 85-lb. rail is obtained as follows:

From Fig.2.		From the large table			
Life 100-lb.	Cars per track per day	Relative life 130-lb. (2x100-lb.)	Annual cost of mainten.	Relative life 85-lb. (4/7 of 100-lb.)	Annual cost of mainten.
10.3	1600	20.6	$1,175	5.89	$1,480
11.4	1400	22.8	1,145	6.52	1,400
12.75	1200	25.5	1,100	7.29	1,320
14.1	1000	28.2	1,080	8.06	1,250
15.9	800	31.8	1,050	9.09	1,165
18.4	600			10.50	1,095
21.1	400			12.05	1,025

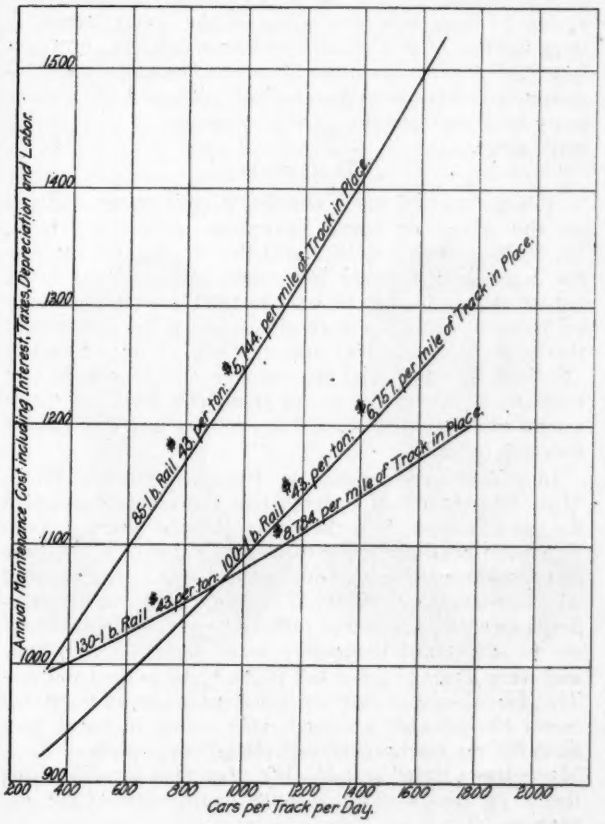


Fig. 3. Comparative Annual Cost of Three Weights of Rail with Varying Density of Traffic

This information is plotted on Fig. 3. Between the limits for which actual data were available, that is, approximately 400 to 1,700 cars per track per day, the 100-lb. rail is economical for a traffic not exceeding 900 cars per track per day. For a greater car movement the 130-lb. rail is economical. As between the 100-lb. rail rail and 85-lb. rail, the data would indicate that on railroads using heavy power and having a wide range of physical characteristics, the 85-lb. rail is no longer economical, but that modern railroading demands a 100-lb. rail. When traffic reaches 1,800 cars per day over a double-track railroad, the point is reached to consider increasing the weight of section to about 130 lb.

These conclusions are influenced to a certain extent by the cost of rail and labor at the particular time on which the investigations were based, and represent closely present day conditions and price levels. In order to determine the effect which the level of costs which prevailed in 1918 and 1919 have on these conclusions, we have made studies which reflect 1914 conditions in a general way. These figures used were arbitrary, but they represent conditions which prevailed previous to present cost levels, and the selection of the economical weight of rail for a given traffic under the pre-war price level may give different results than is the case when present day costs are applied.

In conclusion, it is stated first that the purpose has been to develop a method by means of which the economic weight of rail for various classes of traffic may be determined. The actual values used in this discussion are not at all theoretical, but are based on performance. However, it must be understood that these values actually represent what must be accepted as a particular problem and that if the method here developed is applied, it should be done with values determined to fit the particular case in question.

J. B. Baker, engineer maintenance of way, Pennsylvania System, Cleveland, O., chairman.

Discussion

The discussion of this report centered mainly around a statement submitted by the committee to the effect that the design of track may be radically changed by increasing the weight of rail section in order to strengthen that portion of the track structure and decreasing the strength of the supporting portion of the structure by reducing the number of ties. Most of those present opposed any suggestion to reduce the number of ties per panel, even though the weight of the rail was increased materially and on vote a sentence proposing this plan was stricken from the report.

THE MAINTENANCE OF TRACK JOINTS

By R. H. Howard,

Chief Engineer Maintenance of Way, Wabash, St. Louis, Mo.

THERE are many different kinds of joints in use on the railroads of this and other countries, and each particular joint usually demands more care in maintenance with respect to some particular part of the work than the others; that is to say, properly to maintain a joint its irregularities must be known and given attention.

Physical characteristics of road, such as concern the alinement, grade, ballast, ties and rail, all govern the kind and amount of maintenance the joints require. The traffic also has its influence on this maintenance, so that it is not possible to formulate hard and fast rules for the general maintenance of all types of joints. The same type of joints may be more easily maintained on straight level track than on curves, grades, or on any other combinations of grade and line. Joints on tracks surfaced with good clean well drained ballast are more easily maintained than those on dirty, water-soaked ballast. You all know that it is very nearly impossible to keep up joints unless the ties under them are in good condition. The rail conditions influence the maintenance of the joints in proportion to the wear and creepage and the condition of the ends. Traffic influences the maintenance of the joints in proportion to the wheel loads and the creepage produced.

The work of maintaining joints in the track may be generally stated as including: Drainage which implies the cleaning of ballast, surfacing of ties, tightening bolts, correcting irregularities of line, equalization of expansion, oiling bolts and bars, especially the outside.

Regardless of the other conditions, if the joints are not well drained they will pump, and go down until finally the joint bars are bent, and once this occurs it is impossible to maintain the joint in the same condition as the remainder of the track. The tendency of the track men upon finding bent joint bars is to raise the joints a little higher than the balance of the track, and tamp them a little more solid, thinking that this will reduce the necessity of raising them more often if they merely raised them to the general level of the track.

The advantage of this is questionable because it produces rougher riding track and broken joint bars are the result.

With proper drainage the surfacing problem is taken care of almost automatically. Sufficient ballast should be applied to provide the proper shoulder, and the joint ties tamped to give the same support that is given to the remainder of the track, and the joints should not be raised above the general level.

The joints should be applied with the full number of bolts required by the drilling and care should be taken to see that the joints are full bolted at all times. Omitting one or more bolts in the joint places an undue strain on the remaining bolts, which often results in some of the bolts shearing. There is also great danger of some train being derailed as a result of the side thrust forcing the ends of the rail out of line. The bolts should always be kept tight, except for a very short time in the early spring and winter when readjustment is taking place in the expansion through changes in temperature. At these times bolts should be loosened slightly and the rails given an opportunity to readjust themselves, after which the bolts should be tightened again and maintained tight until it is necessary to readjust the expansion. Every one realizes the importance of this, but it seems that too few of us secure the results we are after.

In nearly every case of bad joints, loose bolts are the contributory, if not the direct cause. Loose bolts permit the rails to separate (expansion to open up), this causes the ends of the rails to batter; bars are not maintained to a proper fit, and the full strength of joints not developed so that in a short time the joint is low, and it is necessary to renew it long before the renewal should have been necessary. Bolts of proper size should be used in order that proper expansion may be maintained. In laying relay rail it is sometimes possible to use a larger bolt in the joint than was used originally because of the wear in the holes of the rails and bars, and wherever possible this should be done. In tightening bolts they should never be over-stressed. The nuts should not be turned up too far on application. They should, however, be turned up as far as a track man can turn them with the ordinary track wrench, and in a few weeks bolts should be gone over again and retightened, using care to place all bolts in the joint in the same tension. The common pipe extension to the track wrench handle should not be used as it multiplies the leverage, and by its use the track men place the bolts in a tension that is not necessary. In case a track man tightents a bolt until it begins to fail by twisting in two, he should complete the destruction of the bolt and apply another and not permit the partly twisted bolt to remain in the joint.

With the use of heat treated bolts, and the ordinary track wrench it is very seldom that a bolt will be twisted in two. I cannot impress too strongly the fact that the value of heat-treated bolts cannot be overestimated as compared with the ordinary bolt. To illustrate, I know of 10 miles of 90-lb. rail laid in 1915, with heat treated bolts, on well ballasted track with slight grades and heavy traffic on which less than one keg of bolts has been used for repairs in this entire stretch to date.

Nut locks should be used on all bolts, as by their use bolts remain tight for a longer period and prevent bolts from rattling. The proper line should be maintained as it is important in economic maintenance of the joints. Just as soon as a joint gets out of line, every train over it will increase the irregularity and make the condition worse.

Joint bars and bolts should be oiled as often as necessary. We have found the average condition requires oiling about every six months. There are special cases which will require oil more often. This oil is applied to prevent rusting and to reduce the action of brine drippings from refrigerator cars to a minimum; also to facilitate the removal of the joint when necessary and for more economical maintenance in the re-using of the bolts. The nuts may be turned off of the oiled bolts in a very short time by one man where it would require the time of two men from 20 to 30 min. to split the nut, and when the nuts are split the bolts cannot be re-applied.

The cleaning of the ballast for proper drainage, surfacing of joint ties, tightening of the bolts, correcting irregularities of line, equalizing expansion, etc., are each largely dependent upon the other. It is usually a combination of conditions that cause bad joints and all of these must be given attention if the joints are to be properly maintained.

DISCUSSION

A large part of the discussion of this paper centered on the oiling of track fastenings, particularly bolts. W. P. Wiltsee (N. & W.) said that during the last year the Norfolk & Western has dipped all new bolts in oil before using and that all bolts in track are swabbed with oil twice a year. As a result of which he is confident that a large saving was accomplished. James Sweeney (C. & E. I.) described the practice of oiling bolts just previous to taking rail out of track as a result of which a man can remove one-third more bolts in a day than if they are not oiled.

In answer to a question by President Powers, W. F. Muff (A, T, & S F.) stated that the manner in which the oil was applied on the Santa Fe was to use a four-inch paint brush and that the practice was to tighten the bolt before applying the oil. When Mr. Sweeney asked why this was done, Mr. Muff replied that it was a safety-first measure since it was difficult to get Mexican laborers to safe-guard themselves when tightening up bolts and were likely to get a fall if the bolts worked too easily. He also said that six years of experience on the Santa Fe indicated a considerable saving in metal, particularly on tracks carrying refrigerator traffic. P. J. McAndrews stated that another advantage accruing from the oiling was a more uniform distribution of the expansion.

Machine oiling of track fastenings was also described at some length. W. A. Murray (N. Y. C.) discussed the practice on the Lackawanna with a car that sprinkles oil at the rate of 25 miles per hour, using 65 to 80 gal. of oil per mile at a cost of $5.50. This process covers all of the rail except the sides and top of the ball and it also sprays a width of five inch inside and outside of the rail. J. M. Fair (P. R. R.) said that the torches commonly used for thawing in winter time had been fitted with special nozzles whereby they may be used in summer time for spraying oil. The use of this equipment has the advantage that the oil can be squirted into crevices in a way that is not possible when hand swabbed. This process necessitates the mixing of some lighter oil with the crude oil in order that it will pass through the nozzle satisfactorily.

This question of the character of oil used was discussed by William Shea (C. M. & St. P.) who stated that his road used a common black oil, adding one-half pound of lamp black to the gallon, thereby obtaining a thicker consistency which was found to remain on the rail for a longer time. Mr. Wiltsee said that the same results could be accomplished by the use of the No. 2 oil (asphaltic base).

E. P. Hawkins (M. P.) questioned the necessity of loosening bolts in the spring and fall of the year as

recommended in the paper for the purpose of allowing adjustment of expansion and contraction in the rail. President Powers said that the necessity of this depended upon the kind of joint. H. Van Gorder (C. & N. W.) recommended the practice.

REPORT ON EQUATION OF TRACK VALUES

IT having long been recognized that the old established practice of making the track sections a standard length, which is generally six miles of single or four miles of double track line, irrespective of the amount of side tracks, railroad crossings or other extraordinary conditions, providing a similar amount of labor on each, was an improper method of allotment. For the past several years this matter has been given a great deal of thought by maintenance of way officers for the purpose of finding some way of accurately measuring the different units of work with a view to equalizing the amount per section, thereby enabling them to distribute

W. P. Wiltsee,
First Vice-President

L. M. Denney,
Second Vice-President

P. J. McAndrews,
Secretary

Coleman King,
Treasurer

labor appropriations according to the volume of work involved. To this end, a few years ago, a number of important trunk lines undertook a study of the situation to find an approximate value of the different units of work. The matter was also taken up by this association, which appointed this committee to continue the study.

Information was secured by a questionnaire containing 22 questions, addressed to about 200 railroad officers, to which 57 answers were received, which have been summarized in the following tabulated statement. The replies were generally uniform.

Subjects:	Replies	Avg.
1. How many miles average passing siding equal one mile of main line?	57	2.75
2. How many average miles of storage, industrial or commercial sidings equal one mile main line?	57	3.84
3. How many average main line turnouts equal one mile main line?	56	15.3
4. How many average siding, yard or other inside turnouts equal one mile of main line?	56	16.77
5. How many average main line railroad crossings equal one mile of main line?	56	10.95
6. How many average siding railroad crossings equal one mile of main line?	55	19.18
7. How many heavy-traffic, important city street crossings equal one mile of main line?	56	9.20
8. How many (medium) important city street crossings equal one mile of main line?	57	14.00
9. How many light traffic street crossings or outlying highway crossings equal one mile main line?	57	20.90
10. How many average farm crossings or other unimportant crossings equal one mile of main line?	57	46.58
11. How many average stock chutes and pens equal one mile of main line?	45	17.00
12. How many average re-icing stations equal one mile of main line?	37	4.15
13. How many average water stations equal one mile of main line?	46	5.50
14. How many average interlocking plants equal one mile of main line?	51	3.40
15. How many average cattle guards equal one mile of main line?	48	48.00
16. How many average feet of track in tunnels equal one mile of main line outside?	38	2848
17. How many average coaling stations equal one mile of main line?	47	3.82
18. How many average fire or cinder cleaning stations equal one mile of main line?	47	2.47
19. How many average station grounds equal to one mile of main line?	52	5.68
20. How many average automatic signals and incidental fixtures equal one mile of main line?	27	20.74
21. How many miles of average fencing equal one mile of main line?	48	15.07
22. How many feet of ordinary average ditching will equal one mile of main line?	42	10160

It was thought by the committee that, to apply the information thus obtained in a practical way, it was necessary to undertake to find the proper length of a section having none of the conditions listed in the 22 questions, and to arrive at that, six additional questions were propounded with reference to length of sections under different tonnage conditions on single and double-track lines, together with the use of motor cars as compared with hand cars, the summary of which is included in the following tabulation:

1. Assuming a double-track railroad having an average normal gross tonnage of 100,000 tons per day or 40 freight trains (20 in each direction), with an average normal number of 12 passenger trains, using a maximum speed of 60 miles per hour; grade generally level, three per cent maximum; line 30 per cent curvature six degrees maximum. What length sections should be established at outlying points if no such conditions prevail as are listed in above questions?	54	3.68
2. What length sections should be established on a single track railroad, having the same curvature and gradient, with one-half the gross tonnage and one-half the number of passenger trains listed above?	52	6.0
3. How much should such sections be lengthened or shortened for each 25,000 gross tons and two passenger trains daily that might be added or taken off on such double track sections	35	0.914
4. How much for a single track section for each 12,000 gross tons or one passenger train?	30	0.867

5. What difference should be made in the mileage of a double-track section having motor cars as compared with hand cars?.....	28	1.17
6. What on single track sections?.....	35	1.20

The average values shown on this statement represent the opinion of practical track men, engineers and others, and we believe is as near a proper conclusion of the unit value of track as it is practical to obtain, and in the main compares very favorably with the findings of the Pennsylvania, Lines West; the New York Central, the Southern Pacific, the Big Four, the New Haven, the Michigan Central and the Grand Trunk, which made exhaustive studies of the matter for their own information and use a year or so ago, and which we understand has been put in practice, at least on a part of these roads. Just how the information was arrived at by all of these roads is not clear to us at this time. On some of them, at least, special assistant roadmasters were appointed to get the information on the ground from one or two years' actual ground study. Since this information is so nearly in harmony with the information secured by the committee it fully confirms the committee's conclusion.

L. C. Ayers, assistant superintendent, Norfolk & Western, Crewe, Va. (Chairman).

DISCUSSION

A great deal of interest was taken in this paper particularly with regard to the possible effect of a system of equated track values on the length of the section and the influence of the use of motor cars. Strenuous objections were also raised to some of the values proposed for particular items as for instance that for railroad crossings, but the general feeling was favorable to the report and it was adopted without modification. E. P. Hawkins (M. P.) described the system practiced on the Missouri Pacific, explaining that all appropriations for money and labor were based on the equivalent main track mileage. In answer to a question regarding possible changes in the lengths of track foremen's sections as a consequence of this system, J. E. Bone (M. P.) stated he has recently asked for an additional section in the St. Louis Terminal, partially as a means of obtaining a more equitable division of the work and partially to secure additional supervision. D. O'Hern (E. J. & E.) objected to the value of 10.95 as the number of railroad crossings equivalent to one mile of main line. In his experience it was entirely too much. In his experience the amount of work required for a crossing was relatively greater than this figure indicated. A number of speakers replied, calling attention to the fact that this was an average value which would not apply in every possible case on account of the wide variation in the amount of traffic passing over crossings. In answer to another question, Mr. Hawkins said that the figures given in the report were based on opinions expressed by officers on some 57 railroads, rather than the result of estimates based on cost data. W. P. Wiltsee (N. & W.) stated that the replies were comparatively uniform, although some widely variant opinions were received which, however, were eliminated in calculating the averages given in the table. W. F. Muff (A. T. & S. F.) and C. J. Coon (N. Y. C.) said that the condition of the crossing and the character of construction would have a great deal to do with the equated values to be given to crossings.

J. W. Powers pointed out the difficulty of equalizing lengths of sections because of the fixed location of headquarters. This brought up the question of motor cars which was discussed at some length and there was a considerable unanimity of opinion that no attempt should be made to justify the introduction of motor cars on the ground of reducing the number of men or increasing the length of the section. Mr. Hawkins explained that it was not the idea that sections should be lengthened by the proportion shown in the table whenever motor cars were introduced, but that the figure was intended as a factor of equalization between two sections, one of which has a motor car and the other had not. He stated also that an attempt to arrive at a figure for the number of men per equated main line miles was abandoned as subject to too much variation.

Some confusion also arose with regard to the item of station grounds and it was explained that it was intended to cover only the specific items of work relating to stations and station grounds given in the Interstate Commerce Commission classification for maintenance of way expenses.

INCREASING THE EFFICIENCY OF TRACK LABOR

By F. G. Jonah, Chief Engineer, St. Louis-San Francisco, St. Louis, Mo.

THE problem of increasing the efficiency of track labor, as, indeed, of all labor, is at the present time a most important one, and its solution must be left in great measure to the roadmasters and supervisors. At the outset, it is safe to say that if left to the roadmasters we would have good track, but there are oftentimes conditions beyond their control which make this very difficult of attainment. Sometimes these conditions are financial, preventing the employment of sufficient labor and materials, and sometimes labor conditions, even when plenty of money is available, may prevent the proper standards of maintenance.

The labor condition being so important, it is profitable to discuss plans for increasing its efficiency. Time was when section labor was abundant and cheap, and, being cheap, no very careful check was kept as to its performance. A man was getting $1.50 a day for 10 hr. work, and if he loafed on hour a day it was a loss of only 15 cents. If he loafs an hour a day now, it is 45 cents wasted—a very serious item for a gang of men.

The first thing necessary in considering the efficiency of workmen is to know accurately what they are doing now and what they are capable of doing, and that gets down to a basis of unit costs. In the past, we have known the total expenditures for various subdivisions of track work, but we have known comparatively little of the amount or quantity of work done for this expenditure. You know that in the transportation department the whole efficiency of the organization is judged by statistical information, based on the unit cost of moving a ton of freight one mile, or carrying a passenger one mile, the mileage of engines per ton of coal, the movement of loaded cars per day, the terminal expense of handling cars, engines and kindred information, which reflects at a glance whether the handling of the road's business is economical or not.

It is possible for one to measure similarly the results of his track gangs, and various railroads are now beginning to undertake it. It is proposed to describe the system which we have started on our road, and I will say that we regard it as well worth the cost, and believe we are getting some results. The basis of this information is the time book. Heretofore men have reported the amount of time that they put in on different kinds of work, but said nothing about the quantity of work done, and we have provided a time book, in which this data can be kept.

We provide, first, a small pocket time book, which the foreman on the job keeps at all times, and in which he enters the names of men employed. During the day he

notes in his own language what they are doing, and how much they have done. This is transferred at the close of the day's work to the monthly time book for the half of the month in which the distribution is made.

It was desired to get cost data on the essential work of track maintenance and, after all, this work falls under comparatively few heads. It was deemed advisable to print the heading for the distribution of time and to make it so plain that the foreman would have no difficulty in transferring from his pocket time book to the distribution sheet correctly. For accounting purposes it was necessary to group work under various account numbers. The accounts and the subdivisions of work which we make under them are as follows:

ST. LOUIS-SAN FRANCISCO RAILWAY LINES

SECTION AND EXTRA GANG LABOR—NUMBER OF UNITS AND AVERAGE COST PER UNIT BY KINDS OF WORK

EASTERN Division. F. A. 329708 Roadmaster, Month of JUNE 1920

ACCT. NO.	KIND OF WORK	UNITS AND UNIT COST	SECTION NUMBERS 13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Extra Gang Numbers A-1	A-2	A-3	A-4	A-5	1	9	38	39	Total Units and Average Cost Per Unit For District	No. ITEM
	Average Rate Per Hour.		.4052	.3983	.3970	.3975	.4084	.3907	.3950	.3989	.3894	.3997	.3976	.7918	.3923	.3900	.3926	.3824	.3414	.3989	.3913	.3977	.3906	.3941	.4129	.4183	.4004	.4094		
1	Clearing Weeds from Track	Trk. Ft.	8880	8000	16400		10840	21120	8800		11400		14452	29024	27700			13490	5800	7240	14000	7680	10140	6470			6190		229814	1
		Cost	.004		.008		.007	.008			.008		.008	.008	.009			.009	.01	.01							.008			
2	Cleaning Ditches in Cuts	Lin. Ft.	21760	8400	7800	4600	7440		800	864	1400	1585	2400	580	1668	8000		8000		840	1800	1920	4000	3936			17460		494424	2
		Cost	.05	.09	.10	.08	.14		.11	.08	.11	.11	.18	.11	.13	.24		.14		.12	.20	.16	.28	.27			.16		.18	3
3	Clearing Surface Ditches	Lin. Ft.																		1160	1600								2760	3
		Cost																		.16	.06								.14	4
4	Mowing and Burning Right of Way	Trk. Ft.	14600	6800	15840		8440				12470	24400				8400	12400	10840		25740			18080						141870	5
		Cost	.009	.007	.006		.008				.001	.01				.007	.01	.001		.008			.005						.008	6
5	Unloading Ballast	Cars																			4		1						81	7
		Cost									1.35										5.64		.78						2.28	8
6	Applying Chats and Gravel Ballast	Trk. Ft.																												9
		Cost																												10
7	Applying Slag and Rock Ballast	Trk. Ft.																												11
		Cost																												12
8	Applying Cinder, Sand or Other Ballast	Trk. Ft.										190																	190	13
		Cost										.27																	.27	14
9	Inserting Ties in Chats and Gravel Ballast	Ties	56				472		56	108	881			800	180		424		100										2058	15
		Cost	.78				.38		.56	.40	.37			.38	.39		.34		.28										.46	16
10	Inserting Ties in Slag and Rock Ballast	Ties																												17
		Cost																												18
11	Inserting Ties in Sand, Cinders or Earth	Ties		20						72	199	801		288				308		80			68	4950		371			1897	19
		Cost		.89						.73	.16	.07		.38				.29		.63			.68	.08		.36			.14	20
12	Surfacing Track on Chats or Gravel	Trk. Ft.	1840	6800	8400	660	3888	8400	8400	8712	6072	2400	2200	4888	1720	1410	4237	2240	1900									720	60436	21
		Cost	.06	.07	.07	.14	.07	.07	.08	.04	.06	.08	.07	.06	.08	.12	.06	.08	.02									.12	.06	22
13	Surfacing Track on Slag or Rock.	Trk. Ft.	880																										880	23
		Cost	.06																										.06	24
14	Surfacing Track on Sand, Cinders or Earth	Trk. Ft.		700		800	580			720	1080			888						8600	8720	840	8280			845			29772	25
		Cost		.04		.13	.04				.08			.06						.04	.07	.08	.08			.09			.07	26
15	Unloading Rail	Lin. Ft.									4112																		4112	27
		Cost									.006																		.006	28
16	Loading Rail	Lin. Ft.																										840	840	29
		Cost																										.008	.008	30
17	Laying Rail	Trk. Ft.	200				88				384	4																	316	31
		Cost	.16				.06				.15	2.44																	.16	32
18	Lining and Gauging Track	Trk. Ft.									1270										600			6000					7870	33
		Cost									.08										.08			.01					.02	34
19	Applying Rail Anchors	Non-fact																												35
		Cost																												36
20	Applying Tie Plates	Non-fact																												37
		Cost																												38
21	Repairing Signs	Number																												39
		Cost																												40
22	Repairing Right of Way Fences	Rod																				1170		4602			1609		7377	41
		Cost																				.02		.007			.02		.10	42
23	Repairing Cattle Guards and Wing Fences	Number							800																				800	43
		Cost							.008																				.008	44
24	Repairing Grade Crossings	Number	4										1					3											4	45
		Cost											2.68					1.01											1.78	46
25	Unloading Coal for Station use	Tons																												47
		Cost																												48
26	Unloading Coal for Water Stations	Tons																												49
		Cost																												50
27	Patrolling Track	Hours	30																										30	51
28	Repairing Roadbed Damaged by Washouts	Hours			20				180													20							200	52
29	Loading and Unloading Ties	Hours		80							41	88		70				10					8						174	53
30	Applying Frogs and Switches	Hours				30			4	80	100	91		48	35	130	78							80	80				614	54
31	Applying Other Track Material	Hours	8	80									280	170		80							80						618	55
32	Repairing Track Damaged by Washouts	Hours			8																								8	56
33	Repairing Track Damaged by Wrecks	Hours																												57
34	Cleaning and Scrubbing Station Buildings	Hours	48												16		8												88	58
35	Transferring and handling Freight at Stations	Hours																				48							48	59
36	Care of Switch Lamps Outside Switch Yards	Hours	87	12	10	18	10	16		9	18	9	18		9	16	19	36	18										215	60
37	Care of Switch Lamps in Switch Yards	Hours																												61
38	Care of Signal Lamps	Hours	48	18	24	24	24			63	48	87	87	48	63	72	54	84	24										597	62
39	Watching Crossings	Hours	240					24																					264	63
40	Clearing Wrecks, Transferring Freight and Storage	Hours																												64
41	Removing and Burying Stock Killed	Hours																			28		4						32	65
42	Removing Snow, Ice and Sand from Platform and Tracks	Hours																												66
43	Signals and Interlockers	Hours		6	10	80	8		10		38		80		10			10			2								170	67
44	Care of Station Grounds	Hours	250			210		128		48	88		210			170		220			12								1318	68
45	New Work	Hours						96																128			480		704	69
46	All other work not classified above	Hours				1877	24		272	1001	12	240	42		248		288	80				20					720		4554	70

NOTE—Cost of mowing and burning right of way as given in this and the following table is low because work in June was limited to mowing the shoulder only.

Account 202

Cleaning Weeds from Track. (This is reported in total hours spent on the work each day and the track feet is shown to give the quantity of work done).

Cleaning Ditches in Cuts. (This is reported in hours and lineal feet).

Cleaning Surface Ditches. (Reported in hours and lineal feet).

Mowing and Burning Right of Way. (Reported in hours and track feet).

Patrolling track, and

Repairing Roadbed Damaged by Washouts. (Reported by hours).

Account 218

Unloading Ballast is reported by hours and by number of cars unloaded.

Account 220

Application of Various Kinds of Ballast is reported in hours, inches of lift and track feet separately for the various kinds.

Inserting Ties in the various kinds of ballast or earth is reported in hours and the number of ties put in, separated for the several kinds of ballast.

Surface Track is reported separately for the various kinds of ballast or earth track on which the surfacing is done, and is reported in hours and track feet.

Loading and Unloading Rail is reported in hours and lineal feet.

Laying Rail is reported in hours, sectional weight and track feet.

Lining and Gaging Track is reported in hours and track feet.

Applying Rail Anchors is reported in hours, the kind and number applied.

Applying Tie Plates is reported in hours, number and sectional weight.

Loading and Unloading Ties,

Applying Frogs and Switches,

Applying Other Track Material,

Repairing Track Damaged by Washouts,

Repairing Track Damaged by Wrecks, are reported in hours only, as it is not possible to make any unit of comparison in the subdivision of work.

Account 221

Repairing Right of Way Fences is reported in hours and rods of fence repaired.

Repairing Cattle Guards and Wing Fences is reported in hours and number repaired.

Repairing Grade Crossings is reported in hours and number repaired.

Repairing Signs is reported in hours, kind and number.

Then there are certain accounts, such as Care of Station Grounds; Removing Snow, Ice and Sand; Signals and Interlockers, which are reported in hours.

The distribution of the section labor which is chargeable to the transportation accounts is reported in hours, and principally to show what percentage of the section gang's time is taken up with such labor, such as Cleaning and Scrubbing Station Buildings; Transferring and Handling Freight at Stations; Care of Switch Lamps Outside of Yards; Unloading Coal for Station Use; Care of Switch Lamps in Yards; Unloading Coal for Water

Stations; Care of Signal Lamps; Watching Crossings; Clearing Wrecks; Transferring Freight and Baggage; Removing and Burying Stock.

These books go to the Bureau of Accounts, where the pay rolls and distribution are made up and where the statistical data relating to unit costs are compiled. The figures are made up in sheets covering definite territory. There is first a grouping of all the sections on a roadmaster's territory, the costs of the various kinds of work on each section, and an average for the whole territory. Next, a grouping of the average of the roadmasters on a division; next, the average of all the divisions in a district, and finally, the average for the whole system. The figures are reviewed by the district engineers and attention directed to work on any territory or section which seems out of line.

Knowing the cost of work, steps can be taken to keep a good average up or to raise a low one, and a few practical hints as to what may be done along this line may be helpful. A few years ago many roads bought power cars for their section forces, and on the assumption that a man could cover so much more territory, lengthened the sections and cut out a few foremen, thus apparently trying to figure sufficient saving in foremen to pay for the gasoline cars. This was at a time when men worked 10 hr. per day. Shortly thereafter the 8-hr. day became general, and the long section is a mistake, as too big a percentage of the day's work is taken up in the time of moving to and from work; and, further, increased traffic, increased number and increased weight of trains all demand more intensive work and supervision, and many sections should be shortened, instead of lengthened. The motor car will be found economical, even on short sections. Wherever a power appliance can be used it should be, to reduce manual labor to a minimum.

With increased wages a better personnel can be secured. All sections should be allowed to carry a force the year round, say, of at least a foreman and four men, expanding to a greater number at times in the summer. Steady employment the year round will hold good men on the sections and give the road a chance to develop good foremen for section and extra gangs.

Consideration should next be given to proper housing facilities. The time for box car bodies as houses for families is past, and the day of the hobo is past. Clean, efficient labor demands a comfortable, commodious,

M-49-C

ST. LOUIS-SAN FRANCISCO RAILWAY LINES

SECTION AND EXTRA GANG LABOR—NUMBER OF UNITS AND AVERAGE COST PER UNIT BY KINDS OF WORK

Month of JUNE 1920

ITEM No.	KIND OF WORK	UNITS AND UNIT COST	RECAPITULATION BY DIVISIONS: EASTERN	SOUTH WESTERN	WESTERN	NORTHERN	DISTRICTS AND TOTAL ENTIRE LINE: SOUTHERN	RIVER & CAFE	TOTAL NORTHERN DISTRICT	CENTRAL	RED RIVER	TOTAL SOUTHERN DISTRICT	TEXAS LINES	Total Units & Avg. Cost per Unit System	ITEM No.
1	Cleaning Weeds from Track	Trk. Ft.	595136	503811	1643193	604140	490008	1198627	5034915	1071296	656542	1727838	587479	7350232	1
		Cost	.01	.007	.006	.01	.01	.01	.001	.01	.02	.01	.02	.01	
2	Cleaning Ditches in Cuts	Lin. Ft.	133679	5037	37812	34796	56072	5640	273056	53812	30680	84492	29700	387228	2
		Cost	.14	.05	.01	.04	.04	.10	.09	.06	.08	.04	.01	.07	
3	Cleaning Surface Ditches	Lin. Ft.	26591	5468	400	10911	143345	5259	191974	15690	4365	19955	10400	222379	3
		Cost	.08	.09	.02	.03	.006	.07	.02	.05	.05	.04	.01	.02	
4	Mowing and Burning Right of Way	Trk. Ft.	4244666	580407	186542	1288298	1141795	1827194	5448897	881610	344062		278833	6727730	4
		Cost	.004	.006	.003	.004	.006	.004	.005	.008	.004		.004	.005	
5	Unloading Ballast	Cars	150	21	504	298	149	155	1407	17	110	127	8	1542	5
		Cost	2.89	4.27	5.34	3.08	3.29	3.84	4.12	1.17	3.45	3.15	3.82	4.04	
6	Applying Chats and Gravel Ballast	Trk. Ft.	12815	6590	11758	17425	792	100	49460	1898		1898		51358	6
		Cost	.05	.05	.09	.04	.01	.10	.06	.05		.05		.06	
7	Applying Slag and Rock Ballast	Trk. Ft.		300		5850	21020	400	27570					27570	7
		Cost		.05		.07	.05	.06	.06					.06	
8	Applying Cinder, Sand or Other Ballast	Trk. Ft.	3494	400	5670	19037	19279	3387	51967	975	200	1175	435	53578	8
		Cost	.14	.04	.08	.04	.12	.12	.08	.14	.26	.16	.08	.08	
9	Inserting Ties in Chats and Gravel Ballast	Ties	6322	6483	5892	19273	1911	3605	46886	5701	379	6080	1803	54769	9
		Cost	.40	.40	.30	.33	.40	.31	.37	.38	.45	.39	.33	.37	
10	Inserting Ties in Slag and Rock Ballast	Ties	667	548	1038	918	7295	1461	11657	2146	1939	4085	113	15855	10
		Cost	.44	.56	.47	.40	.43	.36	.45	.46	.40	.43	.48	.43	
11	Inserting Ties in Sand, Cinders or Earth	Ties	20585	2268	11104	6495	15700	5807	61959	8729	4145	12884	19223	94066	11
		Cost	.19	.46	.32	.39	.24	.37	.26	.31	.43	.35	.14	.25	
12	Surfacing Track on Chats or Gravel	Trk. Ft.	2426828	212863	127071	484364	68386	106516	1241818	164932	8793	173725	41986	1457429	12
		Cost	.05	.06	.08	.04	.07	.06	.06	.04	.08	.04	.07	.05	
13	Surfacing Track on Slag or Rock	Trk. Ft.	27649	4806	385	906	163375	49181	246504	25560	108163	133723	4250	384287	13
		Cost	.08	.07	.13	.06	.09	.07	.09	.09	.09	.09	.09	.09	
14	Surfacing Track on Sand, Cinders or Earth	Trk. Ft.	62379	21544	202019	51178	92455	111937	541519	88692	59220	148212	52741	759472	14
		Cost	.08	.11	.07	.06	.10	.08	.08	.09	.07	.08	.09	.08	
15	Unloading Rail	Lin. Ft.	33762	3752	4821	61156	54462	36806	204771					204771	15
		Cost	.004	.009	.003	.003	.005	.004	.004					.004	
16	Loading Rail	Lin. Ft.	61015	12500	32941	17935	609326	61387	796109	2378	2553	4931	158142	959182	16
		Cost	.01	.007	.008	.006	.005	.01	.006	.01	.007	.01	.001	.005	
17	Laying Rail	Trk. Ft.	7689	3129	54312	2178	116198	27634	211035	628	453	1081	180	212296	17
		Cost	.12	.10	.08	.11	.03	.10	.06	.06	.10	.08	.18	.06	
18	Lining and Gauging Track	Trk. Ft.	22281	53010	23082	104616	68086	60228	331573	35830	11717	47547	28785	407705	18
		Cost	.05	.03	.04	.01	.04	.02	.03	.02	.03	.02	.03	.03	
19	Applying Rail Anchors	Number		154	3696		112		3962		410	410		4372	19
		Cost		.42	.01		.01		.03		.07	.07		.03	
20	Applying Tie Plates	Number			366		1761	4465	6592		228	228		6810	20
		Cost			.04		.004	.03	.02		.12	.12		.02	
21	Repairing Signs	Number		6	254	4			244	1		1	9	254	21
		Cost		4.44	.52	1.09			1.05	4.08		4.08	1.42	.67	
22	Repairing Right of Way Fences	Rod	11237	2908	5698	11263	919	3850	35767	7090	845	7935	1374	45076	22
		Cost	.15	.02	.05	.02	.25	.08	.10	.09	.25	.10	.08	.10	
23	Repairing Cattle Guards and Wing Fences	Number	822	28	112	1552	77	589	3174	111	2	113	2	3289	23
		Cost	.07	3.31	.31	.39	1.93	.39	.56	1.11	8.20	1.23	4.51	.39	
24	Repairing Grade Crossings	Number	39	7	67	93	9	11	216	18	6	24	7	247	24
		Cost	4.62	8.62	1.78	4.11	6.69	2.78	3.66	8.28	6.58	7.85	5.40	4.12	
25	Unloading Coal for Station use	Tons		40			184	25	249	32	203	235		484	25
		Cost		.55			.49	.48	.50	.97	.37	.56		.43	
26	Unloading Coal for Water Stations	Tons	185	40	119	30	417	120	909	363	277	640		1549	26
		Cost	.32	.21	.56	.28	.26	.25	.35	.24	.24	.24		.29	
27	Patrolling Track	Hours	5643	3629	1854	7121	5433	4960	28716	1290	388	1678	1380	31772	27
28	Repairing Roadbed Damaged by Washouts	Hours	1427	68	209	151	636	2652	5124	304	405	709	5	5838	28
29	Loading and Unloading Ties	Hours	2970	1109	2309	1779	2076	846	11089	630	734	1364	487	12940	29
30	Applying Frogs and Switches	Hours	1700	928	487	951	4301	1300	9667	142	836	978	37	10682	30
31	Applying Other Track Material	Hours	12121	12216	4723	10154	9729	6334	55277	2517	1696	4213	72	59562	31
32	Repairing Track Damaged by Washouts	Hours	70	26	542	287	1844	1794	4563	1213	64	1277	37	6477	32
33	Repairing Track Damaged by Wrecks	Hours	460	896	1634	2779	2563	1370	9502	254	737	991	451	10944	33
34	Cleaning and Scrubbing Station Buildings	Hours	356	720	80	395	1256	328	3129	154	56	209	10	3348	34
35	Transferring and handling Freight at Stations	Hours	108	1071	204	470	2832	207	4892	104	136	240	6	5128	35
36	Care of Switch Lamps Outside Switch Yards	Hours	741	2488	1124	2246	1554	2377	11509	2656	1441	4097	63	15697	36
37	Care of Switch Lamps in Switch Yards	Hours	1165	924	295	907	2849	656	6802	551	691	1242	996	9039	37
38	Care of Signal Lamps	Hours	2287	65	128	1928	1981	156	6493				126	6619	38
39	Watching Crossings	Hours	11944	10110	2094	5769	1874	1241	33032	1082	1470	2492	566	36090	39
40	Clearing Wrecks, Transferring Freight and Baggage	Hours	57	1183	919	1601	1603	1116	6479	10	270	280	94	6853	40
41	Removing and Burying Stock Killed	Hours	66	291	28	360	670	164	1579	286	154	440	64	2083	41
42	Removing Snow, Ice and Sand from Platforms and Tracks	Hours			26	2181	73	36	2316		201	201		2519	42
43	Signals and Interlockers	Hours	846	62	20	538	2613	20	4199		30	30	435	4664	43
44	Care of Station Grounds	Hours	4867	3851	2466	5576	8397	2521	28678	2555	2024	4579	862	34119	44
45	New Work	Hours	16675	12247	5414	3713	4926	1015	41192	1303	1359	2662		43854	45
46	All other work not classified above	Hours	57268	20364	27109	16900	45157	25098	192880	6621	10702	17323	45357	256560	46

healthful domicile, and it will pay to establish these. There is no reason why the section foreman should not be one of the substantial, dependable citizens of the community in which he lives. His wages now compare favorably with the village school teacher, and even with many preachers, and the railroads will expect men to measure up to a higher standard than has prevailed in the past.

Extra gangs should be housed in clean bunk cars. A bunk car train should carry a car equipped with shower bath. Cars should be screened and the commissary should be clean and a substantial, nourishing meal served. Many of us can recall the days of the hobo camp, and few can blame the poor devil who put in a month in one from taking the first opportunity he had (at pay day) of going off on a protracted drunk to forget his misery; and he only drifted back to camp because he had nowhere else to go. Labor can no longer be held under conditions that prevailed in the past, and the road that will get the best results is the one that provides best housing conditions and best personnel; and the latter depends largely upon the first.

Next, after good men have been secured, see that they are fully equipped with a complete outfit of tools. That should be your personal business. Men should have all the tools they need to do any kind of work at any time.

Next is material. Money is wasted if extra gangs and section labor is waiting for material.

Do not undertake too much work by doubling up section gangs. It destroys the morale of a section foreman to take him off his own territory to help somebody else out, and the practice should be resorted to only in emergencies—wrecks, washouts, etc. Organize extra gangs to do extra work. Suppose you run three or four section gangs together, at the pay a section foreman gets now, you have very expensive overhead—much more than a good extra gang foreman's salary.

REPORT ON THE USE OF TREATED TIES

T is a well-known fact that in order to get the best results from our ties we must begin in the forests. Tie timber preferably should be cut in the fall and early winter months, when timber contains the least sap and will dry out quickly. Cross ties should be piled as soon as cut in such a manner that they will dry out and season quickly. As many ties begin to decay in the forests while lying in water or marshy places, due to the lack of attention they should receive as soon as cut, little service is attained from them.

All ties should be machine faced and bored for spikes, for all weights of rail, and the ties should be seasoned thoroughly before treatment. It has been demonstrated that a spike has a greater holding power driven in a tie bored for spikes than unbored. Boring also prevents the destruction of the wood fiber when a spike is driven. (The holes should be bored entirely through ties in all cases.)

After the ties have been treated they should be piled in such a manner as to allow them to dry out thoroughly and not be inserted in track for at least 90 days after treatment.

Unloading Ties. Too much care cannot be given cross ties, especially when rail has been distributed in advance, to prevent their ends from becoming damaged by striking the rail.

Tie Renewals. The use of picks to insert ties should be stopped and tie tongs used exclusively, to eliminate the puncturing of ties. All ties should have tie plates, to avoid mechanical wear to the fullest extent.

Rail Renewals. All spike holes should be plugged with machine-made treated plugs, well driven and adzed off smoothly before spikes are redriven.

Tie Spacing. Tie spacing with improper tools also invites early destruction, as ties will decay very quickly when picked, punctured or bruised by mauls or bars. Spike lining track should be avoided as much as possible, as this also invites early destruction to ties.

After careful consideration, we find there is greater economy in using treated ties, as shown in the reports following, and the committee recommends the use of treated ties for the following reasons:

(1) The conservation of timber.

(2) Reduction in the number of tie renewals. We all fully realize the cost of such work under present labor conditions.

(3) More time for general maintenance.

(4) Lessened disturbance of the roadbed, which insures better surface and alinement at a reduced cost.

We also find, on account of the scarcity of tie timber, many kinds of inferior wood are being used with satisfactory results when treated.

The following are the kinds of timber now being treated and the average life of ties obtained:

	Life of Ties in Years		
Kind of timber:	Creosoted	Zinc Chloride	Untreated
Short leaf pine	12	10	5
Long Leaf Loblolly	18	14	10
Fir	..	17	8
Hard Maple	..	18	4½
Beech	..	16	8
White Oak	..	12	9
Hemlock	..	15	5
Tamarack	..	14	6
Cedar	..	..	20
Red Oak	16	16	4
Post or Bur Oak	..	18	9
Redwood	..	..	5
Japan Oak	..	..	8
Eucalyptus	..	..	8
Ohia	..	..	8
Black Walnut	..	..	15

W. F. Muff, roadmaster, Atchison, Topeka & Santa Fe, Newton, Kans. (chairman).

Discussion

This report was discussed by paragraphs. F. J. Meyer questioned the clause relating to the cutting of timber in the fall and early winter because of the small amount of sap in the trees at that time in view of the fact that information given out by the Forest service tends to discount any difference in the moisture content between trees as between the winter and summer months. After some general discussion, John Foley (forester, P. R. R.) was asked to discuss this particular phase of tie production and timber preservation. He explained that the amount of moisture in the tree did not vary to any great extent between winter and summer and had little to do with the quality of the ties produced. He said that the difference in the character of the sap owing to the larger portion of food content in the sap during the growing season was more important, but he placed greater emphasis on the difference in the conditions encountered in the forest in winter and summer, pointing out the fact that during the warm months conditions are much more favorable to decay than in cold weather. Properly conducted wood preserving plants, he said, were operated in a manner that reduced the possibility of rot infection to a minimum and that for this reason it is important to move the ties from the forest to the preserving plant in the shortest possible time. While it is much better to cut wood in winter than in summer, he called

attention to the fact that commercial conditions do not always make it practicable to carry this out. As a consequence of this explanation the statement was modified to show that it was *preferable* to cut ties in the fall and early winter rather than to take the statement mandatory.

Considerable difference of opinion arose as to the practicability of adzing and boring ties before treatment, J. M. Fair (P. R. R.) stating that experience on the Pennsylvania demonstrated that this could not be well carried out, but Mr. Muff said that the Santa Fe had been able to make this a general practice with no particular difficulty. It was the general conclusion that the adzing and boring of ties before treatment was a practice which it was very desirable to adopt wherever possible.

Some question arose as to the correctness of withholding treated ties from track for a period of 90 days but the clause was allowed to stand without change. In answer to a question as to the source of the data given in the table on length of life of ties, Mr. Muff explained that this was an average of figures he obtained as a result of a questionnaire sent to a great many different railroads. Owing to the fact that no replies were received from southern roads, the figures as given in this table are undoubtedly too high to be representative of service secured from ties in the south.

REPORT ON SUPERVISION

IT IS THE opinion of the different members of the committee, based on years of experience under varied conditions, that there is no fixed standard by which the length of a roadmaster's or supervisor's territory should be measured. It would depend altogether on the several conditions enumerated below: Topography of the country, amount of traffic, roadbed condition, amount of clerical help and schedule of trains available for getting over territory.

On an average, we think, the proper length a roadmaster's or supervisor's division should be 100 miles of main line or a freight train engine district. It should at least be sufficiently short to enable the roadmaster or supervisor to see all of his main line in any one day from a passenger train. Every roadmaster should be furnished with a motor car to enable him to see his men often and work with them on all important jobs. The best way to issue instructions to track foremen is by "word of mouth" and the oftener a roadmaster can visit his foremen and talk to them about their work and how to best handle their men, the material and tools the better results will he get out of them.

On account of there being so many different systems on the different railroads we would recommend a general roadmaster on each superintendent's division who should have charge of maintenance of track, the roadmaster or supervisor to report to him. On the larger lines there should be a general roadmaster on each general superintendent's district.

We would recommend monthly meetings in offices of engineer maintenance of way with all roadmasters, superintendents and general superintendents present to discuss expenditures for the ensuing month and other matters.

As regards training foremen, one system now being worked very satisfactorily on several roads is to have a small extra gang of 10 to 15 men on the division under the roadmaster, with a first-class foreman in charge. This gang is called the "School Gang," and the laborers receive five cents per hour more than other laborers on the division. This gang is to do all kinds of track work. Each laborer in this gang is to be given his turn at supervision under the direction of the foreman. After such a gang has been employed all the year round on a roadmaster's division for two or three years, it is not any trouble to get the very best men who live in the towns along the line to go to work in the gang, as they have seen many men promoted from it to better positions.

The members of this committee are of the opinion that it is not good policy to place young men in soft jobs, such as timekeepers, clerks, flagmen, etc., expecting them to eventually turn out as track foremen and roadmasters. We feel that the severity of our apprenticeship is a very necessary evil to the education of good foremen or roadmasters.

William Shea, general roadmaster, Chicago, Milwaukee & St. Paul, Chicago, Ill. (chairman).

DISCUSSION

The portion of this report referring to the length of the supervisors territory was adopted without any change, the discussion being largely a confirmation of the idea that the supervisor's territory should be small enough so that he can come in personal contact with his foremen. A most active discussion related to the proposed method of training men for positions as foremen by means of a small extra gang of especially selected men. F. J. Meyer (N. Y. O. & W.) expressed doubt as to the possibility of increased compensation to the men in this gang under the terms of the wage award and the national agreement. Mr. Shea replied that it was the idea that these men would be classed as assistant foremen whereupon Mr. Meyer and a number of others expressed doubt as to the practical operation of this scheme. P. J. McAndrews (C. & N. W.) said that the operation of this plan would not necessarily preclude the selection of men for positions as assistant foremen in the regular section gangs and that in consequence the plan would not necessarily discriminate against the man with a family who could not readily be placed in a floating gang.

Mr. Shea explained that the object of the committee in proposing this plan was to overcome the present scarcity of suitable material for foremen. This he considered a most serious matter which requires correction in some manner. The object of having the men in extra gangs is to train men in all round experience which they would not receive when acting only as laborers or assistant foremen in section gangs. W. F. Muff (A. T. & S. F.) confirmed this position, stating that in the absence of one of the foremen he was sometimes compelled to double up gangs owing to the lack of a man to take the foreman's place. He also told of the failure of a plan to employ student foremen, stating that he found it impossible to make them stick.

WHERE ARE OUR TIES COMING FROM?

By HERMANN VON SCHRENK,

Consulting Timber Engineer, St. Louis, Mo.

THE FOREST service estimates the total stand of available timber in the United States at the present time to be 746 billion cubic feet, of which 485 billion is in the form of saw timber and 246 billion cubic feet is in the form of cord wood. The standing timber is roughly distributed as follows: One-half in Washington, Oregon and California; the remainder in the east, north and south; 62 per cent of all standing timber is found west of the Great Plains. Going more into detail and using the regions shown in the map, the timber is distributed as follows: New England, 2 per cent; Middle Atlantic region, 2 per cent; Lake region, 5 per cent; central region, 6 per cent; southern Atlantic and eastern Gulf region, 10 per cent; lower Mississippi region, 13 per cent;

Rocky Mountain region, 10 per cent, and the Pacific Coast region, 52 per cent. Of the total available supply a little over one-fifth is hard woods and the remainder soft wood. The total timber used per year amounts to about 26 billion cubic feet, of which some of the larger items are as follows:

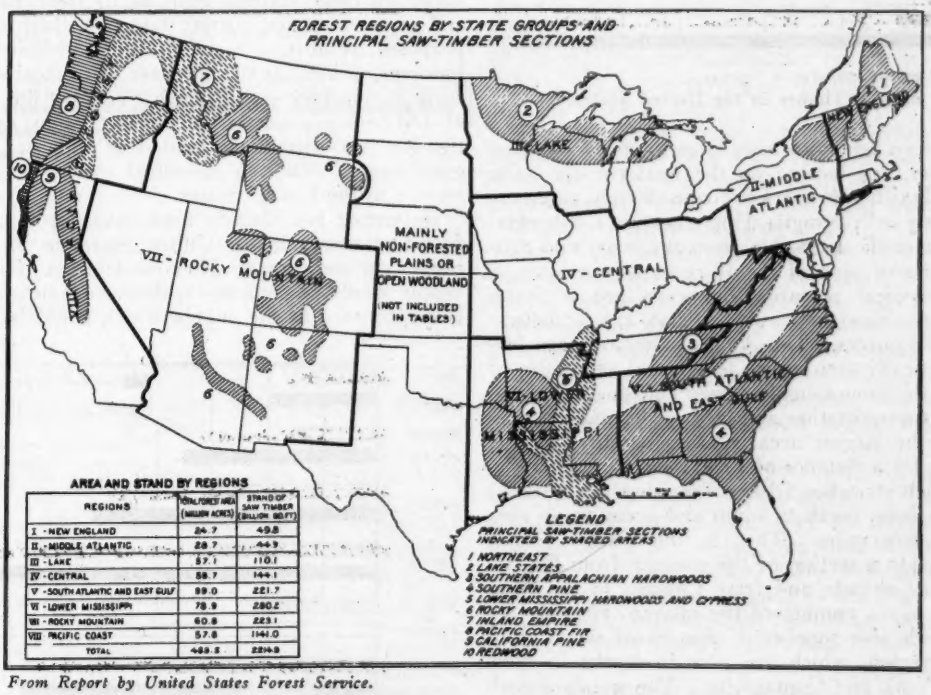
At the present rate of consumption, it will be noted that

	thousand cu. ft.
Lumber	8,913,300
Hewn ties	1,050,000
Fencing	1,800,000
Fuel	10,450,000
Destruction by fire	1,080,000
Destruction by insects and disease	650,000

At the present rate of consumption there is practically 30 years' supply if regrowth is not considered.

The Forest service estimates that the annual growth on present forested areas is approximately six billion cubic feet. In the charts shown, which are taken from the Forest service report in response to the Capper resolution, an idea of the relative distribution of timber supplies in the various sections of the country may be obtained. These indicate definitely that our greatest resources are found in the Rocky mountain and Pacific coast regions. At the present rate of cutting, the forests in New England, the middle Atlantic, central and Gulf states will not last very long. Quoting from the recent Forest service report: "Within the next 10 years the lumber cut will probably drop to one billion board feet; within 20 years most of the timber areas containing high grade timber will be cut off and the remaining timbers will be either on farm wood lots or on a few remaining large tracts and will be made up of second growth or the trees which were left as worthless at the time of first cutting." Similar statements are made for most of the sections. The southern pine forests are being cut out at a rate which, according to a statement recently made by the Southern Pine Association, indicates that approximately 82 per cent of the saw mills now operating in the south will be cut out in 5 years or less and over 97 per cent will be cut out in 10 years or less with a correspondng reduction in the output of 78 per cent. Attention is called, however, that this does not mean that the total production will be reduced at this rate, because there will probably be many small mills in so-called second growth tracts.

The outlook for the 30 years' supply above referred to deals with the timber situation as a whole. In all probability the tie supply will extend for a considerable additional period. Almost any kind of tree is now utilized for tie purposes, particularly since most species have been made more or less suitable for tie purposes by chemical preservation. Then, again, the tie supply is not dependent upon the saw mill. The largest tie supply still comes to the railroads in the form of hewn ties, made in many instances in small numbers from farmers' wood lots and so-called cut-over lands. As the output of sawed ties is reduced from large mills, the probability is that small mills will appear here and there as they have already done in many of the eastern states, and yield local ties in regions which may have been regarded as wholly exhausted.


FOREST REGIONS BY STATE GROUPS AND PRINCIPAL SAW-TIMBER SECTIONS
MAINLY NON-FORESTED PLAINS OR OPEN WOODLAND (NOT INCLUDED IN TABLES)
VII - ROCKY MOUNTAIN
IV - CENTRAL
II - MIDDLE ATLANTIC
III - LAKE
I - NEW ENGLAND
VI - LOWER MISSISSIPPI
V - SOUTH ATLANTIC AND EAST GULF
AREA AND STAND BY REGIONS
LEGEND
PRINCIPAL SAW-TIMBER SECTIONS INDICATED BY SHADED AREAS
1 NORTHEAST
2 LAKE STATES
3 SOUTHERN APPALACHIAN HARDWOODS
4 SOUTHERN PINE
5 LOWER MISSISSIPPI HARDWOODS AND CYPRESS
6 ROCKY MOUNTAIN
7 INLAND EMPIRE
8 PACIFIC COAST FIR
9 CALIFORNIA PINE
10 REDWOOD

REGIONS	TOTAL FOREST AREA (MILLION ACRES)	STAND OF SAW TIMBER (BILLION BD FT)
I - NEW ENGLAND	24.7	49.8
II - MIDDLE ATLANTIC	28.7	44.9
III - LAKE	57.1	110.1
IV - CENTRAL	58.7	144.1
V - SOUTH ATLANTIC AND EAST GULF	89.0	221.7
VI - LOWER MISSISSIPPI	78.9	280.2
VII - ROCKY MOUNTAIN	60.8	223.1
VIII PACIFIC COAST	57.8	1141.0
TOTAL	455.5	2214.9

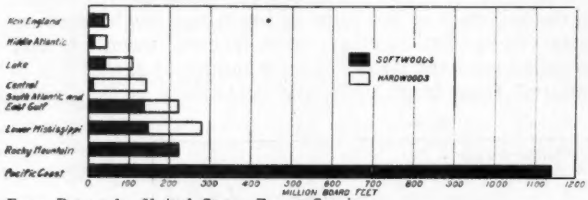
From Report by United States Forest Service.

Forest Regions of the United States.

The conclusions to be reached by a careful study of the Forest service figures indicate that the American railroads need not worry for some years to come. There will doubtless be changes in the source of supply, changes in the kinds of wood used, changes in the methods to make certain types of wood better fitted for crosstie purposes and probably changes in first cost.

The second source of supply will be from countries in Central America and South America—in other words, possible supplies of tropical hard woods. From time to time during the last 30 years there have been sporadic tie shipments of one kind and another from tropical countries, but this field of supply has practically not been touched. At the present time numerous offerings are being made of various kinds of tropical woods and a brief review of the tropical situation may not be without interest. Mexico, the nearest country with a relatively large timber supply, has a forest area of approx-

imately 20 million acres, most of which belongs to the Mexican government. The forest is of two kinds—the mountain and highland forest composed largely of pines, and the tropical forest. Some of the pines are of very superior quality. Most of the pine areas, however, are situated on mountain ranges more or less inaccessible at present. The other, or the tropical forest, extends along the edges of the Central plateau and contains a large number of tropical hard woods. For instance, in the territory tributary to Vera Cruz there are some 85 different species of oak. Guatemala, Nicaragua and other



From Report by United States Forest Service.

Stands of Saw Timber in the United States.

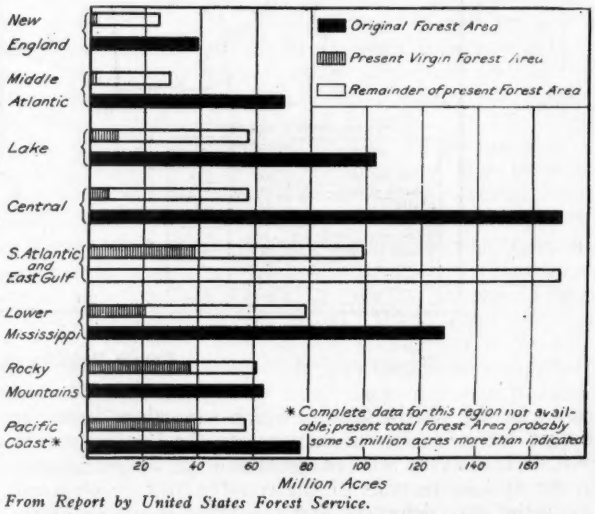
Central American republics have large supplies, most of which, however, are located on the western side. On the Gulf of Mexico side there are considerable pine forests, particularly in Nicaragua, Honduras and Guatemala, many of them easily accessible from the coast and producing a species of pine of highly resinous character.

The chief tropical resources, however, are in South America. It is almost impossible to state the actual extent of these resources. The Andes mountains are forested for practically their entire length and very little of the timber in the mountains has been cut, due largely to difficulties of transportation and lack of demand. Brazil has probably the largest area. According to Zon, the Amazon flows for a distance of 1,860 miles through a virgin forest which stretches 1,100 miles from east to west and 750 miles from north to south and occupies an area of 825,000 square miles. This, in the United States, would be equal to a section of the country from the Atlantic coast to Colorado and from Chicago to the Gulf. Several years ago a number of the eastern railroads imported a considerable number of species of wood from the Amazon region, which are now in tracks in New Jersey, New York and Connecticut. The woods are all extremely hard and bear no resemblance whatever to the woods found in the United States. The Guianas are very rich in forest resources and there are numerous rivers which would facilitate bringing out desirable timbers. It is in these countries that the valuable green heart and mora are found. Venezuela and Colombia, although with fewer forests, can also be counted upon for a very large future supply. On the west coast, the mountainous parts of Chile and Peru are extensively forested, but there is practically no utilization of their woods at the present time. In fact, these countries import most of their timbers from the United States. The West Indies, while heavily forested in some sections, cannot begin to compare as to quantities available with Central and South America.

While these vast quantities of timber are undoubtedly available in the tropics, attention should be called to the fact that immediate unlimited uses of these resources can hardly be looked for. Tropical timbers grow in dense jungles (excepting the pine forests in Mexico and Central America) and usually a large number of species grow close together. In other words, the forest is very different from the northern forests, where a certain species may predominate on an acre.

In this connection it should be pointed out that the fitness of tropical woods for use as ties in the United States is as yet almost wholly unknown. Most species have very hard woods which in their native lands may have given excellent service in the construction of buildings, as railroad ties, bridge lumber, etc. When brought to the northern temperate regions, however, many of these very excellent woods fail utterly when used in the form of track ties. These hard woods split and check when exposed to the wide extremes of temperature running from zero to 125 deg. F. or more. In other words, they are unable to withstand the expansion and contraction to which they are naturally subject in most of the regions of the United States. As there is no means of foretelling what any tropical wood is going to do, it is obvious that the purchase of any particular number of any species must be attended with considerable risk. During the last 30 years a large number of species have been imported but owing to unfavorable records both as to their names, origin and years of service, correct data as to their fitness for tie purposes are in most cases wanting. Sufficient is known, however, to indicate the purchase of tropical woods in the form of ties irrespective of what country they come from should be consummated only after the most careful investigation as to their names and after years of trial in small quantities of definitely identified species in actual track service in the United States.

Reference has already been made in considering the forest resources in the United States to the amount of timber cut and grown. No consideration of a possible tie supply would be complete without very definite and positive reference to the supply which could be obtained if



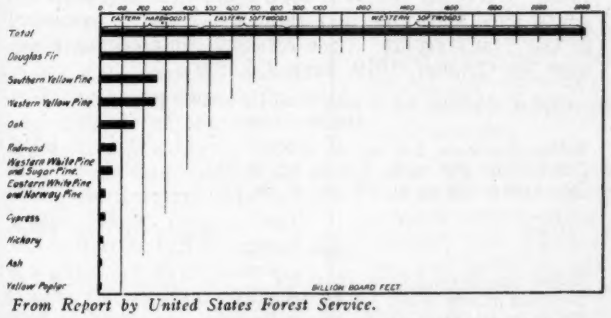
From Report by United States Forest Service.

Original and Present Forest Areas of the United States.

proper forest measures were taken by the government and the people of the United States.

To the majority of people the amount of wood formed in a growing tree appears very insignificant when viewed from year to year, but do not forget that while trees grow slowly they grow constantly and the cumulative effect of this persistent growth when taken over considerable areas is surprisingly large. United States Forester Graves made a statement last year that if the southern pine forest covering 124,000,000 acres were fully covered with trees, it would produce an average of 70 cu. ft. per acre per year, or 27½ billion feet board measure per year. One can realize the enormous amount of regrowth which takes place when one considers that a large portion of the yellow pine ties utilized during the last 20 years have grown since the civil war.

Perhaps the best summary of future possibilities is given by Forester Greeley in the Senate Report referred to. "If all of this land had been cut over in the first place with due regard to securing a future stand and had been protected from fires and excessive grazing after cutting, it would now be producing timber at least three times as fast as at present. Judging from the experiences of other countries and from results obtained where forests have been carefully treated in our own country, it is believed entirely conservative to assume that the 3,260,000 acres could produce at an average rate of 60 cu. ft. of wood per acre per annum or, in terms of timber, 150 ft. b.m. per acre per annum. This would mean a total annual growth on the present area of cut forest land, includnig that now devastated, of 19½ billion cu. ft. of wood, including 40 billion cu. ft. of saw timber. At the same rate or production for the remaining 137,000,000 acres of virgin forest in which there is now no net increment, our total commercial forest area is capable of producing



From Report by United States Forest Service.

Saw Timber Stands of Some of the More Important Species of Wood.

annually after the virgin timber has been cut off, at least 27¾ billion cu. ft. of wood, including 70 billion ft. b. m. of saw timber. This exceeds our present rate of use and destruction. With a reasonable per capita consumption it would be able to meet indefinitely the needs of our growing population for wood and various other forest products."

In the foregoing I have dealt with the tie supply as affected by forests here and elsewhere. In conclusion I want to refer to something much more personal and that is the assistance which we who are interested in the maintenance of tracks can give in connection with this tie problem. It is obvious that if we can get more service and longer life out of the ties which we have, it means that less ties will be required each year. Ties now cost almost two dollars apiece in the track and it is high time that we use every possible offort to make that two-dollar tie worth two dollars to our companies. I could speak for many hours with reference to this latter subject, but will confine my remarks to some general headings.

How can we obtain greater life out of our ties? In the first place, every possible effort should be directed toward using only chemically treated ties. With the present high initial cost of the untreated tie a life of 5 to 7 years can hardly be justified. There is absolutely no reason why the life of the average tie could not easily be extended from 12 to 20 years or more. No untreated ties should be used with the possible exception of ties made of the heart woods of cypress, red wood and cedar. Many lines are today treating all ties, including white oak. White oak ties have been regarded as non-treatment tie, but with the poorer quality now going into the manufacture of ties, white oak as well as all other timbers should be treated. It seems rather discouraging to note that in spite of the general appreciation of the value of using treated ties, at the present time only approximately one-fourth of the ties used every year are treated. We should take a lesson from our European associates. For instance, in England, Baltic pine ties serve 25 years in the track and then are cut up and made to serve as fence posts and in other places for another 25 years.

A second method by which we can obtain increased service is by being more attentive to the tie from the time it is cut from the tree until it is treated or put into track. A large percentage of ties are lost every year by careless handling. Either they are left in the woods or on the right of way too long and become decayed or split and are then considered either entirely worthless or serviceable only in inferior classifications of tracks. An enormous saving might be realized over the country as a whole if it were more generally realized that all woods cannot be handled in the same manner. White oak will stand considerable abuse; not so red oak, red gum, sap pine. A little planning in the purchase and the inspection of ties will frequently result not only in a tie of superior quality, but in the saving of vast numbers of ties which are now going to waste.

A third method would consist of greater care in the handling and using of ties from the time they are received until they are ready to come out. Included under this heading are some of the following factors.

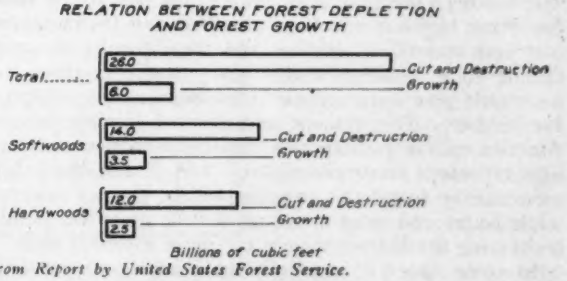
Work constantly for better drainage of track. A well drained track means that much longer life for the ties. This applies particularly to untreated ties and to ties treated with water soluble salts like zinc chloride.

When using ties treated with water soluble salts, so arrange tie shipments and tie insertions that the zinc treated ties may be stacked along the right of way from four to six weeks before insertion. An air-dried zinc-treated ties will stay in track longer than one put in freshly treated.

Whenever you find a badly checked or split tie, put in an "S" iron or a bolt. This applies to ties before they are treated as well as after they are treated.

When laying ties in track be sure to lay them always with the heart side down. This will materially reduce splitting and checking and add to the length of life.

When handling ties, both treated and untreated, do not bruise or abuse them at any time. Holes or bruises in-



From Report by United States Forest Service.

Demonstration of the Excess of Depletion Over Growth.

flicted with picks, shovels or track tools cut down the life of the tie to a very measurable degree. Use tie tongs and other tools which will reduce bruising to the greatest possible extent. This also applies to unnecessary adzing.

Keep all new ties in properly constructed piles. See to it that the lowest tier is at least six inches off the ground. Keep the ground around tie piles, both in storage yard and along the track, free from weeds. This not only increases the length of life of the ties, but guards against loss by fire. In piling ties keep the upper tier on a slant so as to afford cover against rain and snow.

When spikes become loose, put in treated tie plugs be-

fore redriving. Also, where it is necessary to drive spikes at a new point, plug the old hole with a treated tie plug.

Use tie plates wherever possible and have these with as large a bearing surface as possible. There is nothing which so largely increases the mechanical service of a tie as a properly designed tie plate. Most of the plates used in the past have been too small. Therefore, use one of sufficient area.

The above are a few hints as to what may be done daily by the track man to increase the service of the tie. In other words, remember that the service of a tie is determined, first, by resistance to decay, which means starting out with a sound tie, keeping it as dry as possible and free from wounds, and, second, by its resistance to mechanical destruction, which means protection from rail wear and the numerous forces constantly at work tending to destroy the physical nature of the wood.

A proper appreciation of the value of the wooden product, whether it be the tie used by the railroad man, the boards used in the building of houses, sidewalks or fences, the poles used in the construction of the telephone and telegraph lines, and the thousand and one articles manufactured from the tree, will altogether make for increased public respect of this invaluable material and will hasten the day when we will see the realization of the picture painted by the Government Forester, when there will be enough boards for all the houses we will require and when the railroad man will have all the ties he wants.

REPORT ON CONSTRUCTION OF STREET, HIGHWAY AND FARM CROSSINGS

IT is the aim of this report to emphasize and supplement the recommendations of last year's committee. The question of public crossings at grade is very important, both from the standpoint of the railroad and the public, and it has not received the consideration that its importance deserves. The amount of vehicle traffic over street crossings is increasing at an enormous rate, and we must now consider a type of crossing that will be safe and practical for the public as well as the railroad, and the next consideration is a type that will be economical. The public is demanding and has a right to expect better crossings than have generally been provided in the past.

It has been the general practice in the past to use plank for street, highway and farm crossings, but the increasing cost and scarcity of lumber and the difficulty in maintaining such crossings under heavy traffic requires that we should give some serious consideration to a substitute for lumber. The amount and cost of lumber used in America in the construction and maintenance of crossings represent enormous figures, and if suitable substitutes can be found this expense will be greatly reduced; while better and safer crossings will be provided, besides conserving the lumber supply for more essential uses.

In some cases it has been the practice to construct crossings of stone screenings or cinders, but this committee does not recommend this type. This type of crossing is difficult to maintain in good condition. The screenings or cinders foul the ballast in the crossing and on both sides of the track for some distance, and this results in rough track and damage to the rails.

Concrete slabs are being used at some points as a substitute for plank, and are giving good results. Such crossings installed in 1919 cost approximately $1 per square foot, not including the cost of the metal flangeway.

Last year the committee recommended the use of bituminous and macadamized crossings, and this committee concurs in that recommendation. This type of crossing has been in use since 1912, and has filled every requirement, both as to safety and economy, besides satisfying the critical public. The crossings are easily built and maintained and are suitable for any class of railroad in any locality. The committee recommends that as far as possible all rail joints be eliminated in road crossings, that drainage be installed, and that all road crossings and highway crossings be made of crushed stone of standard size, mixed either with road oil, bitumin, macadam or asphalt, or any other good substitute for lumber. The sealing of the crossings with these substitutes will keep out the moisture and frost and eliminate the heaving of tracks to a great extent, and also the heaving of crossing planks, which is a source of great danger and damage to equipment. On tracks located in streets, where the movement of trains is slow, the tracks should be paved with some good material. In the construction of any permanent type of crossing the matter of drainage is of vital importance and the success of the crossing will depend largely on the drainage conditions. Excellent results will be obtained if crossings are constructed according to formulas 1, 2 and 3, presented in last year's report. (See *Railway Maintenance Engineer* for October, 1919, page 355.)

Cost of Formula No. 1, with Road Oil at 1920 prices.

Double Track:

Ballast size stone, 6.46 cu. yd. at 85c	$ 5.40
One-half in. size stone, 3.26 cu. yd. at $1	3.26
Oil to cover 352 sq ft., 100 gal. at 20c gal	20.00
Total	$28.66

Single Track:

Ballast size stone, 2.53 cu. yd. at 85c	$ 2.15
One-half in. size stone, 1.33 cu. yd. at $1	1.33
Oil to cover 144 sq. ft., 50 gal. at 20c gal	10.00
Total	$13.48

Planking $31.00.

Cost of Formula No. 2, with Bituminous at 1920 Contract Prices.

Double Track:

Ballast size stone, 6.46 cu. yd. at 85c	$ 5.40
One-half in. stone, 3.26 cu. yd. at $1	3.26
Oil to cover 352 sq. ft. at 3c	10.56
Total	$19.22

Single Track:

Ballast size stone, 2.53 cu. yd. at 85c	$ 2.15
One-half in. size stone, 1.33 cu. yd. at $1	1.33
Oil to cover 144 sq ft. at 3c	4.32
Total	$ 7.20

Planking $31.00.

Cost for formula No. 3, at 1920 prices.

Double Track:

Ballast size stone, 6.46 cu. yd. at 85c	$ 5.40
One-half in. size stone, 3.26 cu. yd. at $1	3.26
Oil to cover 352 sq. ft., 100 gal at 29c	29.00
Total	$37.66

Single Track:

Ballast size stone, 3.53 cu. yd. at 85c	$ 2.15
One-half in. size stone, 1.33 cu. yd. at $1	1.33
Oil to cover 144 sq. ft., 50 gal. at 29c	14.50
Total	$17.98

Planking $31.00.

Where the track is already well ballasted with stone, it will not be necessary to use the quantities of ballast size stone given in these formulas, and this will reduce the cost to that extent. Where the tracks are paved with brick in crossings or streets, good, clean stone ballast should be provided, and this should be covered or roofed with concrete, a sand cushion placed on this and the brick laid and filled with a good binder. This type of construction costs about twice as much as planking, but in many cases will last from 8 to 15 years without repairs.

The prices quoted in these formulas may vary slightly in different localities, but they will be approximately

correct for a large territory, and if local prices are applied to the quantity shown it will give a very good idea of the cost of these types of crossings.

J. B. Martin, supervisor, New York Central, Elkhart, Ind. (chairman).

Discussion

This report elicited active interest and a number of members described the practices which they followed in the construction of macadam crossings. Mr. Martin explained that the formulas given in the report were not intended to be followed to the exclusion of other formulas, but rather suggested what could be done. Upon question as to whether these crossings would comply with statutes of the various states or rules issued by the public utility commissions or municipalities for the construction of highway crossings, a number of the members stated that the public was generally pleased with these crossings. Having gained permission to build a single crossing there was no difficulty in having others of the same type accepted. D. A. Joyce (Erie) stated that he had found the macadam crossings were excellent for medium or light traffic highways and described a process for the use of asphalt and rock with the addition of some clay on the top. It was his experience that these crossings shed water very satisfactorily, yet they remained sufficiently elastic as not to be affected by vibration.

P. J. McAndrews (C. & N. W.) cautioned against the use of too large an amount of dust or fine screenings in preparing the wearing surface of the crossing, and this view was confirmed by others. In answer to questions concerning the effect on track circuits, Mr. Martin stated that a coating of asphalt paint on the rails before placing the macadam construction afforded thorough insulation.

There is no question of greater importance among the employees of the maintenance of way department than that of morale. You roadmasters are charged with the duty of producing results. Efficient and satisfactory results can only be produced by an organization whose morale and disposition to efficiency is on a 100-per-cent basis. Therefore, a grave responsibility rests upon you men in re-establishing that esprit de corps and morale among your section foremen and laboring forces which spells success.

We are now emerging from the effects of a war period which brought with it an appalling spirit of unrest among laboring forces. It is not only your duty and obligation, but should be your ambition and pride to overcome the effects of this disturbing influence and re-establish that old spirit of harmony and helpfulness between the railroad and its employees that existed during the pre-war period, and which meant so much for the advancement and prosperity of each individual.

As the years roll on, conservative labor will see more and more the advantages of private control of the railroad systems. You can help to bring about this realization quickly. If private control is to be made a success, and in my opinion the railroads can only be successful under that form of operation, it will be through the loyal support of its army of employees. The prosperity of the one necessarily means the prosperity of the other, so that employees and managements are mutually interested in demonstrating that co-operation and helpfulness between each other will be mutually advantageous.—*From an address by Wm. H. Armstrong, president of the Track Supply Association.*

REPORT ON WELDING

THE COMMITTEE will confine its discussion to the oxy-acetylene process exclusively. Experience has shown that other combustible gases, such as hydrogen, Blau or liquid gas, illuminating gas, benzine or benzol vapor, may be used with oxygen for this purpose, but these have not proven as thoroughly satisfactory as acetylene for reasons which are beyond the scope of this report. Electric welding might also be mentioned. For a number of years it was used as a laboratory experiment, but now has been fully developed. The equipment, however, is too expensive and not as readily adaptable for track work as the gas methods.

An oxy-acetylene welder of ordinary ability will be able to build up at least two switch points in an eight hour day. The consumption of gas when used continuously for welding purposes should be 33.8 cu. ft. of oxygen and 27 cu. ft. of acetylene per hour. During the eight-hour period the welder, however, will be using gas only about 30 per cent of the time. This gives a basis for determining the cost if we apply the varying prices for oxygen and acetylene and the rate of labor.

Proper welding is an art and requires experience and knowledge in operation. If the welded switch point readily chips, breaks off, or otherwise proves defective, the economy of the process is lost. It is, therefore, essential that proper material be used to make the weld and that a thoroughly experienced man be employed. If too much oxygen is used in the flame, it will lead to the metal becoming overheated and cause a burning of the welding seam. If too much acetylene is used, it will cause carbonization of the iron and a hardening of the metal seam. Both of these results cause a condition commonly known as brittleness and are very undesirable in a switch point.

Steel, when subjected to heat, changes its composition. This is especially true when subjected to the oxy-acetylene flame, so in order to get the best results it is necessary that the material used in welding be of a proper composition for the purpose intended. A composition steel put up in rods and commercially known as "No. 2 rods" should be used for welding frogs and switches. The composition of these rods is such that when the rods are melted at the proper temperature in the acetylene flame it will become approximately of the same chemical composition as the material in the frog or switch. It is to be understood, however, that since the metal is flowed on and not rolled like it is in the making of rail, it does not become as fine grained and tough as the steel in the rail.

Claims have been made that welded switch points have outlasted new ones; and also that they have chipped, broken off and proven entirely unsatisfactory. Both of these contentions have a basis of fact, but the conclusion of this committee is that a properly welded switch point is not quite as lasting as one of perfect new material.

How the Work Is Done

For the benefit of those who have not done any welding of switches, it might be well to describe a general method that has given good results. Welding should be done under a roof not only to protect the men during inclement weather, but also to protect the cylinders of gases

from the direct rays of the sun. The switch point to be welded should be clamped workwise to a piece of rail of the same section, the rail to have a good head. The piece of rail need not be over four or five feet long. The proper neutral oxy-acetylene flame is then applied to the switch point at the point where the welding material is to be added, and is generally heated by the flame until a molten bath is formed in which the welding rod should be submerged and allowed to melt off without actually coming in contact with the flame. As mentioned previously, it is necessary to have a properly adjusted flame to avoid an inferior weld. By following this method the chemical composition of the rod and the original material is maintained, and the resultant structure will be good. As the metal solidifies it should be tapped lightly with a hammer. The purpose of using the hammer is to refine the grain structure of the metal, thereby giving a denser and tougher material, comparing favorably with metal that has been rolled. The hammering should be done while the weld is still in a bright yellow heat and should cease as soon as the weld falls to a dull red. Heavy hammers or heavy blows should never be used. Care should be exercised to make the contour of the welded point as nearly as possible to that required by standard. It is recommended that an emery wheel be used on the point to make it perfectly smooth, as without this the work is usually left in a rough state which tends to grind and wear away wheel flanges.

The general discussion above on switches applies also to the building up of all frogs with the exception of those commonly known as hard center or manganese frogs, which have not as yet been successfully welded by the oxy-acetylene methods, although extensive experiments are being carried on and the outcome is not altogether hopeless.

The repairs to frogs by means of the oxy-acetylene flame should not, however, be confined altogether to the building up of worn sections. By means of the cutting torch—a correlated device to the welding torch—parts of frogs can be readily made to replace a broken part. The cutting torch is of somewhat different design and performs in a somewhat different manner than the welding torch. It not only has a heating flame but also an independent jet for oxygen. The cutting is altogether a chemical operation. The heating flame is merely intended to heat the iron to the point where it will readily unite with the oxygen fed from the independent oxygen jet. This forms an iron oxide which melts at a much lower temperature than the iron itself. The molten oxide either flows or is blown out of the cut and leaves a fresh, thoroughly heated line through the metal for the further action of the cutting oxygen. The above remarks only apply to steel and wrought iron. Cast iron and certain alloy steels do not act in this manner.

In cutting, an excess of oxygene is used, ranging from 4 to 1 to 20 to 1, according to the thickness of the metal to be cut. Different nozzles for the torch are required to give this result. It is highly essential when cuts are made that it be done quickly to avoid overheating the adjoining metal and thereby injure the structure of the steel. In track work this is important, as injury to the steel ultimately results in breaks.

A simple welding outfit consists of a welding blowpipe, several welding heads, an oxygen regulator, an aceylene regulator, the necessary hose, a supply of oxygen and a supply of acetylene. The cutting outfit consists of a cutting blowpipe with set of cutting nozzles, oxygen cutting regulator with two gages, an acetylene regulator with one or two gages, an adapter for acetylene cylinder, one length high pressure rubber hose for acetylene, one length copper armored hose for oxygen, darkened spectacles, a supply of acetylene and a supply of oxygen.

In conclusion, the committee wants to express the view that the oxy-acetylene equipment is a very desirable outfit for the trackman, not only to repair frogs and switches, but for general repair work. However, it cannot assert too forcibly that only experienced men familiar with the technical features involved should be permitted to handle the equipment and do the work to get highly satisfactory results at a comparatively small cost. The committee is not prepared to recommend that frogs and switches repaired by this method be used in high speed tracks.

M. Lipman, division engineer, Pennsylvania System, Philadelphia, Pa., chairman.

DISCUSSION

E. P. Hawkins (M. P.) expressed his confidence in the value of oxy-acetylene welding. He pointed to the necessity for proper workmanship, stating that the man is the most important element. The Missouri Pacific, he said, had 12 blacksmith cars equipped for doing the welding and that a number of these were employed in the St. Louis and Kansas City terminals. J. E. Bone (M. P.) said that the best results were secured in building up a worn frog by taking it out of track and that in repairing the frogs in ladder tracks, an extra frog was provided to insert in track while one of the frogs was removed for repairs. When the line was not too busy the work was done with the frog in the track.

W. P. Wiltsee (N. & W.) said that on a line handling trains at intervals at 15 to 20 minutes the work could not be done satisfactorily without removing the frog from the track. Mr. Bone confirmed the idea that a longer interval between trains was necessary for proper work and also called attention to the necessity for bolting up the frog thoroughly before starting to apply the new metal.

Mr. Lipman was asked about the practicability of burning bolt holes in rails and answered that it could be done but discouraged the practice for main line rails because of the possibility of injuring the metal and causing a rail break. He said also that while the oxy-acetylene flame could be used for burning off bolts when uncoupling rail released from track, the necessity for moving the outfit every time that the work was started on a new splice had a tendency to run up the cost. P. J. McAndrews (C. & N. W.) said that this difficulty could be overcome by placing the gas tanks on a push car and moving them from place to place in this manner, providing the traffic on the line was not too great.

The possibility of building up the battered ends of rail heads with the oxy-acetylene process was suggested and A. W. Tabert (C. & N. W.) described how he carried out this work under traffic. He did not recommend this as being economical for a long stretch of track other than it would be possible to restore surface to rails at exceptionally bad joints. This work required about an hour's time at each joint. He explained that the work was checked with a straight edge while the torch was being used and that the surface was dressed by hammering the new metal while still hot. Mr. Lipman stated that the life secured from frogs restored by the oxy-acetylene process was about 85 to 95 per cent of that secured with a new frog.

J. M. Fair (P. R. R.) described a series of experiments in an attempt to develop a method of restoring manganese frogs in a manner similar to that carried out with ordinary rolled rail frog construction. He stated that the results obtained thus far have not been satisfactory. W. F. Muff (A. T. & S. F.) said that rail joints in highway crossings had been welded by taking the rails out of track for the time required to complete the weld at a cost of $4.50 per joint for the welding alone, ex-

clusive of the cost of opening the crossing and taking the rail out of track and restoring the track and crossing to service.

The Banquet

On Wednesday evening a party of 533 persons, including the roadmasters and their families, were guests of the Track Supply Association in a dinner held in the ballroom of the Statler hotel. William H. Armstrong, president of the Track Supply Association, acted as toastmaster and introduced the two speakers of the evening, C. E. Johnston, general manager of the Kansas City Southern, Kansas City, Mo., and Colonel F. W. Green, vice-president of the St. Louis Southwestern, St. Louis, Mo. Mr. Johnston discussed the labor problem with particular reference to its scarcity, inefficiency and lack of morale. He questioned whether the lack of results which are now popularly ascribed to inefficiency is something for which the men are responsible. In his opinion working conditions under which too large a proportion of the time is spent in non-productive work must be blamed in large part and it behooves railway officers to devise some plan whereby the men will be kept at productive work for a larger proportion of their time. Mr. Johnston also reviewed the history of the labor market during the past five years leading up to the present condition under which the character of men available is such that very few of the men are of a type suitable for promotion to foremen. This he considered one of the most serious problems to be overcome by the supervisory officer. Another matter of equal importance is the restoration of an esprit de corps. He admonished the roadmasters to take a greater personal interest in the foreman, to obtain a human contact and learn the foreman's problems, and his personal interests, and give these matters the greatest possible consideration in carrying out the work.

Colonel Green paid a tribute to the old-time roadmaster with his characteristics of dominating personality, resourcefulness and dogged-perseverance, relating a number of anecdotes to bear out this point. Colonel Green's talk largely confirmed Mr. Johnston's views with regard to lack of productive results by the men. He believed that the present tendency to depend on correspondence, bulletins and "butterflies" rather than personal contact was largely to blame. Care in giving personal instructions to the foreman while still allowing him to exercise his individual initiative was suggested as a means to the desired end.

Closing Business

The treasurer's report showed that the receipts during the year amounted to $3,737.74 and the total disbursements to $3,736.04, while the total assets of the association at the present time equal $1,811.70. The secretary's report showed the membership of the association to be 1,137, including nearly 100 members received during the last year.

The following officers were elected for the ensuing year: President, W. P. Wiltsee, principal assistant engineer, N. & W., Roanoke, Va.; first vice-president, L. M. Denney, supervisor, C. C. C. & St. L., Indianapolis, Ind.; second vice-president, J. P. Corcoran, roadmaster, C. & A., Bloomington, Ill.; secretary, P. J. McAndrews, roadmaster, C. & N. W., Sterling, Ill.; treasurer, Coleman King, supervisor, Long Island Railway, Jamaica, N. Y.; members of the executive committee for four years: J. B. Martin, supervisor, N. Y. C., Elkhart, Ind.; J. W. Blalock, roadmaster, C. R. I. & P., Pratt, Kan.; member of the executive committee for one year to fill the unexpired term of Mr. Corcoran, G. W. Koontz, roadmaster, D. & H., Carbondale, Pa. Chicago was selected as the place for holding the next convention.

The following subjects were selected for consideration by committees during the ensuing year: (1) The Classification and Distribution of Second-hand Rail, W. Shea, general roadmaster, C. M. & St. P., Chicago, chairman. (2) The Most Economical Method of Laying and Renewing Track and Switch Ties with Special Reference to the Conservation of Time and Timber, C. S. Brooks, general roadmaster, Terminal Railroad Association of St. Louis, St. Louis, Mo., chairman. (3) Methods of Stimulating Rivalry Between Track Forces, G. W. Koontz, roadmaster, D. & H. Carbondale, Pa., chairman. (4) The Construction and Maintenance of Railroad Crossings, D. O'Hern, roadmaster, E. J. & E., Joliet, Ill., chairman. (5) The Records and Accounts of a Roadmaster's Office, F. J. Meyer, assistant engineer, N. Y. O. & W., Middletown, N. Y., chairman.

On Thursday evening the members of the Roadmasters' Association were the guests of the St. Louis Railway Club, at which time Earl Stimson, chief engineer maintenance of way, Baltimore & Ohio, Baltimore, Md., presented a paper on "The Bonus System in Track Work," and J. B. Strong, vice-president of the Ramapo Iron Works, Hillburn, N. Y., on "The Standards of the Manganese Track Society."

THE TRACK SUPPLY ASSOCIATION

At no time in the past have the officers and members of the Track Supply Association made a greater effort to present a successful exhibit than this year. Because of the limitations of the hotel, it was impossible to obtain sufficient space on the same floor as the convention, and the entire third floor was therefore set aside for the exhibits, which were arranged in the most accessible manner possible under the limitations imposed by the necessity of presenting these exhibits in small rooms.

The officers for the Track Supply Association for the past year were: President, W. H. Armstrong, Ingersoll-Rand Company, New York; vice-president, D. T. Hallberg, P. & M. Company, Chicago; secretary-treasurer, W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y.; directors, E. T. Howson, *Railway Maintenance Engineer*, Chicago; Alexander Chapman, Rail Joint Company, Chicago; F. M. Condit, Fairbanks, Morse & Co., Chicago, and Herbert T. Potter, Wyoming Shovel Works, Wyoming, Pa.

The list of exhibitors, together with the names of the representatives in attendance and the materials on display were as follows:

Air Reduction Sales Company, New York; oxygen, acetylene, welding and cutting apparatus; R. T. Peabody, F. L. Nix and J. Sewings.

American Hoist & Derrick Company, St. Paul, Minn.; transparencies and photographs of railroad ditcher; J. J. Cox, J. L. Hickey, C. T. Hook, W. B. Maurer, D. O'Brien, Howard Johnson and Miss Helen Hoeller.

American Steel & Wire Company, Chicago; railroad fence, woven wire fence, rail bonds, concrete reinforcing, and steel fence posts; L. B. Shanahan, John Alexander, J. W. Collins, A. N. Frouds and M. E. Evans.

American Valve & Meter Company, Cincinnati, Ohio; switch stands, and safety switch locks; J. T. McGarry and F. C. Anderson.

Anchor Company, Milwaukee, Wis.; rail anti-creepers; Orlando Metcalf and George H. Chadwell.

Balkwill Manganese Crossing Co., Cleveland, Ohio; models of an articulated cast manganese railway crossing; S. Balkwill.

Bethlehem Steel Company, Bethlehem, Pa.; switch stands, R. E. Belknap, R. W. Gillispie, Neil E. Salsich, J. F. Hennesy, E. D. Campbell, J. H. Budd, E. B. C. Coyne, J. H. Riddle, C. S. Jordan and C. A. Alden.

Buda Company, Chicago; section car, jacks, switch stand, track drills and tool grinders; M. A. Evans, C. H. Bull, S. F. Francks, T. L. Hall and G. W. Hoover.

Bucyrus Company, South Milwaukee, Wis.; slides showing steam shovels and spreader plows; E. C. Lewis and Mark J. Woodhull.

Carbic Manufacturing Company, Duluth, Minn.; flare lights

and cakes and oxy-acetylene cutting and welding equipment; C. H. Bolinder.

Chamberlain, M. E., St. Louis, Mo.; forms and reinforcement for concrete ties, posts, poles and buildings; M. E. Chamberlain.

Chicago Malleable Casting Co., Chicago; rail anchor tie plates; W. M. Osborn.

Crerar, Adams & Co., Chicago; bonding drills, track drills, jacks, shovels, brooms and die starters, oil cans and emery grinders; Russell Wallace, G. B. Bassett, J. A. Martin, W. I. Clock, E. W. Koon and K. D. Begeman.

sene burner thawing outfits; Willis C. Squire and G. A. Nelson.

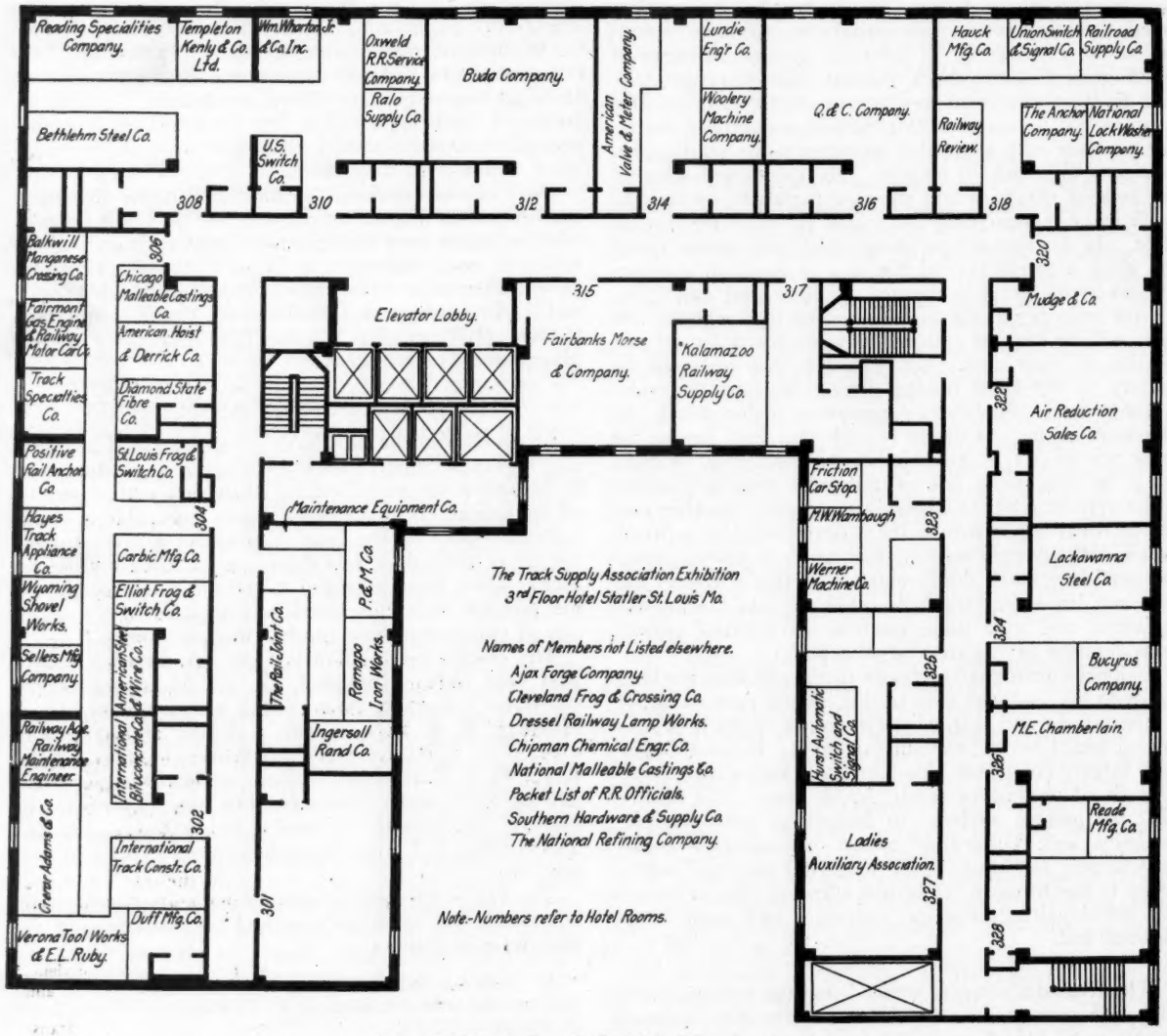
Hurst Automatic Switch, St. Louis, Mo.; automatic safety switch; Chas. M. Hurst.

Hayes Track Appliance Company, Richmond, Ind.; derails and stands; S. W. Hayes and H. J. Mayer.

International Bituconcrete Company, New York City; bituminous floors, platforms and crossings; C. A. Henderson.

Industrial Track Construction Company, St. Louis, Mo.; car bumpers.

Ingersoll-Rand Company, New York City; tie tamping equip-



How the Track Supply Exhibit Was Arranged

Diamond State Fibre Company, Bridgeport, Pa.; fibre for insulated joints; C. Swallow.

Duff Manufacturing Company, Pittsburgh, Pa.; track jacks, with square and round socket levers and automatic lowering geared ratchet; C. N. Thulin and E. E. Thulin.

Elliot Frog & Switch Company, East St. Louis, Ill.; guard rail clamp, adjustable switch stand and bridle rods; W. F. Fairback, W. H. Elliot and D. Fairback.

Fairbanks, Morse & Co., Chicago; light inspection car, equipped with two cylinder kerosene engine and section maintainers and extra gang cars; E. C. Golladay, A. A. Taylor, F. M. Condit, Charles Wilson, G. Howard, D. K. Lee, E. J. Coverdale, L. H. Matthews, E. E. Pendray, H. L. Hilleary, H. J. Beckers and L. Norwell.

Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn.; roadmasters' inspection cars, and hand car engine, 6 hp. ball-bearing motor and 4 hp. ball-bearing motor; H. E. Wade and W. D. Brooks.

Friction Car Stop Company, Cleveland, Ohio; model track and car stop; J. H. Duffy.

Hauck Manufacturing Company, New York City; Hauck kero-

ment and air-operated track tools; William H. Armstrong, C. S. Kulp, J. N. Thorp, Jr., and C. H. Dougherty.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.; inspection car, motor cars, electric tie tampers, supervisor's combination gage and level; J. B. McKinnon, D. A. Stewart and H. R. Miller.

Lackawanna Steel Company, Lackawanna, N. Y.; rail joints, safety head angle bar, joint plates, hook shoulder tie plates, track bolts and spikes, deseamed rails, steel sheet piling; G. O. Benson, H. G. Austin, C. M. Cuthbert and G. C. Holmes.

Lundie Engineering Company, New York City; Lundie tie plates; C. Z. Moore, Eugene Brandeis, W. Brooke Moore and L. B. Armstrong.

Maintenance Equipment Company, Chicago; illustrations of a rail layer, photographs of derrick truck cars, ballast screen, models of a switch point straightener, blue flag derail, fence posts, tie spacer and unloading hooks; W. W. Glosser.

Mudge & Company, Chicago; standard section and inspection cars; Karl J. Eklund, L. O. Stratton, C. P. Benning, J. M. Mulholand and W. F. Baker.

National Lock Washer Company, Newark, N. J.; nut locks; Alvin Thompson.

Oxweld Railroad Service Company, Chicago; oxy-acetylene welding and cutting apparatus; F. C. Hasse, W. H. Kofmehl, L. C. Ryan, C. M. Marshall, A. W. Whiteford, R. C. Kohn and F. C. Tichen.

P. & M. Company, Chicago; anti-creepers and bond wire protectors; D. T. Hallberg, J. E. Mahoney, F. W. Reeve, P. V. Samuelson and P. Hamilton.

Positive Rail Anchor Company, Marion, Ind.; rail anchors, guard rail brace and plate, guard rail; Arnold H. Told and L. C. Ferguson.

Q. & C. Company, New York City; rail joint, guard rail clamps, snow melting track device, rolled steel step or compromise joint, derails, rail bender and car replacers; L. T. Burwell, J. L. Terry, R. J. McComb and Louis Thomas.

Rail Joint Company, The, New York City; standard, compromise, frog and switch joint, insulated rail joints; W. S. Boyce, Alexander Chapman, Charles Jenkinson, R. W. Payne, G. T. Willard, J. N. Mead and C. B. Griffin.

Railroad Supply Company, Chicago; tie plates; H. G. Van Hostrand, E. P. Cowing and R. H. Bell.

Railway Review, Chicago; copies of paper; C. L. Bates and W. M. Camp.

Ramapo Iron Works, Hillburn, N. Y.; manganese switch point, rolled steel double-shoulder switch slide plate, special switch slide plate, machined heel plate, switch stands, guard rail clamps; Thomas E. Akers, J. B. Strong, Robert J. Davidson, Jr., and W. C. Kidd.

Reade Manufacturing Company; motion pictures, showing application of weed exterminator; R. H. Boyle.

Reading Specialties Company, Reading Pa.; guard rail clamps, rail benders, rerailers with clamps, compromise joints; J. J. O'Connell and J. N. Lee.

Ruby, E. L., Philadelphia, Pa.; portable rail milling machine; E. L. Ruby.

Ralo Supply Company, New York City; track throwing device; Major A. W. Whiteford.

Sellers Manufacturing Company, Chicago; anchor-bottom, wrought-iron tie plates; G. M. Hogan, R. A. Van Houten and T. D. Crowley.

St. Louis Frog & Switch Company, St. Louis, Mo.; manganese frogs; R. E. Einstein.

Simmons-Boardman Publishing Co., Chicago; copies of *Railway Maintenance Engineer* and Railway Age; E. T. Howson, W. S. Lacher, B. J. Wilson, M. Moore, R. H. Smith and J. M. Rutherford.

Templeton, Kenly & Co., Ltd., Chicago; track jacks; H. B. Burlow and L. S. Allen.

Track Specialties Company, New York City; guard rail clamp, compromise rail joints, tie plates and rail braces, guard rail brace adjustable track shim, slide plate and switch brace, rail joints, and anchor plate; J. A. Bodkin.

Union Switch & Signal Company, Swissvale, Pa.; insulated rail joint; J. J. Cozzens.

United States Switch Company, Eau Claire, Wis.; model of automatic switch lock; J. W. Hubbard.

Verona Tool Works, Pittsburgh, Pa.; track tools, track jacks, levels, gages, nut locks, rail joint spring and bonding strips and portable milling machine; H. C. Mull, E. L. Ruby, E. Woodings, and A. T. Palmer.

Wharton, Jr., & Co., Inc., William, Easton, Pa.; guard rail, guard rail clamps, and photograph of a No. 10 A. R. E. A. standard rail bound manganese steel frog; H. F. McDermott, Charles M. Griffith, V. Angerer and J. H. Hock.

Werner Machine Company, West Allis, Wis.; spike straightener; A. W. Tabert.

Woolery Machine Company, Minneapolis, Minn.; 5 hp. hand car motor; H. E. Woolery.

Wyoming Shovel Works, Wyoming, Pa.; track shovels; H. T. Potter, Lou Braden and G. E. Geer.

Wambaugh, M. W., St. Louis, Mo.; model of steel I-beam track tie; M. W. Wambaugh.

Closing Business

At the annual meeting of the Track Supply Association on Thursday the following officers were elected for the ensuing year:

President, D. T. Hallberg, P. & M. Company, Chicago.

Vice-president, Herbert T. Potter, Wyoming Shovel Works, Wyoming, Pa.

Secretary-Treasurer, W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y.

Directors, W. H. Armstrong, Ingersoll-Rand Company, New York (ex-officio); Alexander Chapman, Rail Joint Company, Chicago; F. M. Condit, Fairbanks, Morse & Co., Chicago; A. H. Told, Positive Rail Anchor Company, Marion, Ind.; J. J. Cozzens, Union Switch & Signal Company, Swissvale, Pa.

THE MATERIAL MARKET

THE PRESENT slump in prices, which is receiving so much attention in the newspapers, has had little effect on the railway material market. With the falling off of orders there has been some weakening of prices so that little business is being placed at the maximum figures given in the table of prices below for iron and steel commodities. Reductions in the lumber field have not been very tangible, while prices for Portland cement have undergone even further advances, ranging from 20 to 30 cents, effective September 1. There is, however, an underlying tendency towards deflation so that prices are expected to be reduced somewhat from the present levels. Thus, whereas it was definitely anticipated that the prices for 1921 delivery to be established by the United States Steel Corporation would be at a higher level than the base prices maintained by the corporation during the past year, the nature of the new prices is now decidedly indefinite. In the face of anticipated reductions wire products are decidedly steady and cast iron pipe has actually advanced $6.30 a ton.

Rail is still being quoted at $45 to $55 a ton for Bessemer and $47 to $57 for open-hearth steel, but contracts are generally being withheld pending a more definite price. However, many railroads have made rolling reservations so that a large tonnage is quite definitely scheduled for next year. The business in other track materials is also active.

The structural steel market is still slow. The tonnage under contract on August 31 was 72,000 tons, or about 40 per cent of plant capacities. Among recent contracts in the railway field has been one for a bridge over the River Rouge on the Detroit, Toledo & Ironton, aggregating 1,000 tons. Current prices for iron and steel products of interest to the maintenance of way department are quoted below:

	Prices in Cents Per Pound			
	August 15		September 24	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes ....$	$4.00	$3.82 to $4.52	$4.00 to $4.25	$3.73 to $4.38
Track bolts	7.00	5.17 to 5.52	6.00 to 6.50	4.98 to 5.38
Boat spikes	4.50	4.77	4.40 to 5.00	
Angle bars	2.75	2.75	2.75	2.75
Tie plates, steel..		3.00 to 4.00	....	3.00 to 4.00
Tie plates, iron...	3.75 to 4.00	3.75 to 4.00	....	3.75 to 4.00
Plain wire	3.00 to 4.00	3.27 to 4.27	3.25 to 4.00	3.63 to 4.38
Wire nails	3.25 to 4.50	3.52 to 4.77	3.25 to 4.50	3.63 to 4.88
Barbed wire, galv.	4.10 to 5.10	4.37 to 5.37	4.10 to 5.10	4.48 to 5.48
C. I. pipe, 6 in. or larger (per ton)		76.80	..	83.10
Plates	2.65 to 3.50	2.72 to 3.72	2.65 to 3.50	3.08 to 3.88
Shapes	2.45 to 3.50	2.72 to 3.52	2.45 to 3.50	2.83 to 3.63
Bars (steel)	2.35 to 3.50	2.62 to 4.27	2.35 to 3.50	2.73 to 3.88

While the scrap market has been subjected to some fluctuation during the past month, the quotations for items originating in the maintenance of way department show but little change from the figures given last month as indicated in the table below:

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$57.50 to $62.50	$50.00 to $55.00
Rerolling rails	37.50 to 38.50	35.00 to 36.50
Rails less than 3 ft. long	27.50 to 28.00	24.00 to 24.50
Frogs and switches, cut apart	24.50 to 25.00	24.00 to 24.50
	Per net ton	
No. 1 railroad wrought	23.50 to 24.00	23.00 to 23.50
Steel angle bars	24.50 to 25.00	21.50 to 22.00

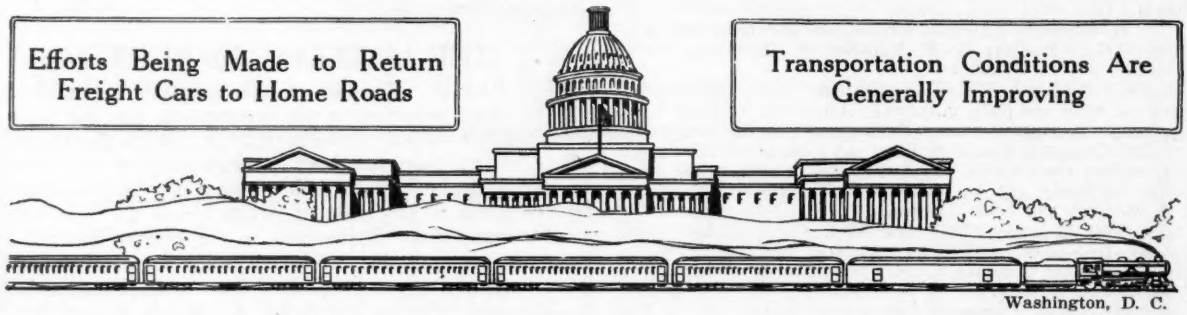
The price of cement, as mentioned above, has advanced throughout the middle western cities, as indicated by the table below, which gives prices per barrel in carload lots, not including the cost of package:

Pittsburgh	$2.42	St. Paul.....	$2.71
Cleveland	2.73	Toledo.....	2.71
Indianapolis	2.57	Milwaukee.....	2.59
Chicago	2.35	Duluth	2.35

RESULTS OF RATE ADVANCES NOT ESTABLISHED

Efforts Being Made to Return Freight Cars to Home Roads

Transportation Conditions Are Generally Improving



Washington, D. C.

ON SEPTEMBER 1 the railroads of the United States entered upon a new stage and are now operating upon their own resources without the assistance of the government guarantee, which was continued for six months from March 1 to August 31 at the rate of one-half of a year's standard return, such as was paid as rental for the properties during federal control. However, the railroads are now operating under a new level of rates established by the Interstate Commerce Commission's decision, in accordance with the provisions of the transportation act, intended to give them an opportunity to earn a net operating income equal to 6 per cent in the aggregate on the sum which the Interstate Commerce Commission has held for temporary purposes to be their value.

It has been estimated that the rate decision would increase the revenues of the roads by approximately $1,500,000 a year. This estimate was predicated, however, on the assumption that the increases would be applied alike on state and interstate traffic. Several of the state commissions have refused to grant the full amount of increase as allowed by the commission, particularly in cases where there are state passenger fare laws, but on petitions filed by the railroads the Interstate Commerce Commission has promptly instituted an investigation to ascertain if the lower state rates effect an undue discrimination against interstate commerce. If it is found that they do so discriminate within the meaning of the law the commission is given power under the transportation act to correct the condition.

While it is possible only to estimate the amount which the six months' guarantee cost the government, as the August earnings are not yet known and the July figures are not yet complete, it has been roughly calculated that the government will be found to owe the railroads as of September 1 on account of its guarantee approximately $600,000,000, less about $234,000,000 of advances made from the Treasury on certificates issued by the Interstate Commerce Commission. One-half of a year's standard return is approximately $450,000,000 and up to the end of July the railroads as a whole had earned practically none of this. The decision of the Railroad Labor Board increasing wages, which was made retroactive to May 1, also adds approximately $200,000,000 to the amount of the guarantee. Up to September 1 the commission issued certificates for advances to about 175 railroads for the purpose of enabling them to meet pressing requirements before the entire amount of the guarantee could be determined.

The period in which advances could be received on account of the guarantee expired on August 31, but as many roads will continue to need cash during the time that must elapse before the exact amount due can be determined, an effort has been made to work out a plan by which partial payments on account may be made in advance of the final settlement, which will serve practically the same purpose as the advance specifically provided for in the law. The railroads will hardly know before about October 1 what they have earned during August and many adjustments will be required before the final settlement can be made, such as those in the maintenance accounts, as to which the commission is to determine how much can be charged for the purpose of calculating the guarantee. Great interest will naturally attach to the first reports of earnings under the new rates which went into effect on August 26, but it will be two or three months before the statistics of the roads as a whole for September will be available.

In view of the fact that reliable information with respect to the operating expense of the guarantee period as affected by material and supply issues can be obtained in no other way, the Interstate Commerce Commission announced that it would require carriers accepting the guarantee to take an inventory of materials and supplies as of the close of business August 31 and adjust their accounts for the period March 1 to August 31.

Railway Returns for June and Six Months

During the first six months of 1920 the Class I railroads had a net operating income of $7,336,531 as compared with $156,086,467 in the corresponding period of 1919. This figure is arrived at, however, after charging into the January revenues approximately $50,000,000 of back mail pay, after the payment of $11,874,385 for war taxes since March 1, which were not included in the 1919 expenses, and after only $25,462,027 of the increased wages resulting from the decision of the Railroad Labor Board retroactive to May 1 had been charged to the expenses. For the month of June the roads had a deficit of $16,284,900 as compared with a net operating income in June, 1919, of $52,000,000. For the six months' period the railroads in the Eastern district had a deficit of $80,000,000 while the roads in other districts had net operating income as follows: Pocahontas District, $7,871,000; Southern District, $16,629,000; Western District, $63,469,000. Preliminary returns for July indicate a deficit for that month for the roads as a whole.

Transportation Conditions Improving

A very marked improvement in transportation conditions throughout the United States has taken place during the summer and particularly during the past few weeks, as the railroads have gradually overcome the effects of the "outlaw" strike of yardmen which were particularly acute in April, and also in response to the intensive campaign for an increase in the efficiency of freight movement which has been carried on under the general direction of the Advisory committee of the Asso-

ciation of Railway Executives and of the Commission on Car Service of the American Railroad Association. Since September 1 the name of the Commission on Car Service has been changed to the Car Service division of the American Railroad Association to avoid confusion between its name and that of the Interstate Commerce Commission. The railway executives at a meeting in New York on July 16 adopted a program of standards to be attained, pledging themselves to exert every possible effort to bring about an average daily movement of freight cars of 30 miles per day, an average loading per car of 30 tons, to reduce the percentage of bad order cars and locomotives and to bring about the return of cars to the home lines. While the reports are not yet available for a sufficient period of time to indicate a great deal in the way of progress accomplished since the adoption of this program, the reports for the first six months of this year show that material progress has been made in most directions and the reports which are now available up to the end of August show that the railroads are handling an enormous volume of business.

A record movement of freight for the month of August is indicated by the reports compiled by the Car Service Division showing the revenue car loading. For the week ended August 28 the total loading was 985,064 cars, as compared with 951,653 in the corresponding period of 1919 and 980,931 in 1918, and for the four weeks ending August 28 the total car loading was 3,853,822 as compared with 3,580,367 in 1919 and 3,849,026 in 1918. As the traffic handled in August, 1918, was greater than that for August, 1917, it is apparent that the freight business for August this year was larger than for any preceding August. The loading for the week ended August 28 not only established a new record for this year, exceeding that for the preceding week by nearly 21,000, but it approaches the largest record ever made. During 1918 in May and October there were two or three weeks when the total freight loading was slightly over 1,000,000 cars. For the week ended September 4 the accumulations of delayed cars had been reduced to 64,060. This is a reduction of about 6,000 cars as compared with the preceding week. About 25,000 of the delayed cars were held for export and coastwise movement. The car shortage, however, is increasing as the demand for cars in the grain section increases. For the week ending September 1 the average daily "deferred car rquisitions" was 151,440 for th United States and Canada, of which 81,902 were box cars, and 146,070 for the United States alone.

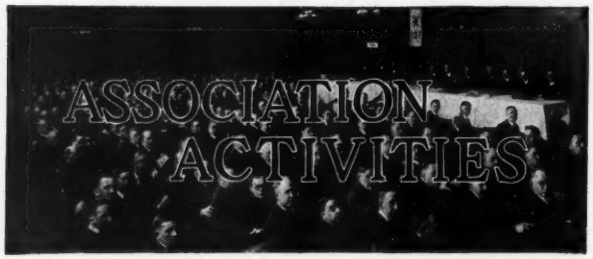
The weekly reports received from the local committees on car service continue to show an improvement in service at most points and of progress in the campaign for car conservation. At most terminals switching service is reported as normal or practically normal, although at some cities there is still a shortage of switching forces. Shortages of labor for car repairs are reported from many points, but many of the committees report an improvement in labor conditions, both as to numbers and as to efficiency. The Twin Cities committee reports that labor conditions have not been so good as at present in the past four years. At Pittsburgh the committee states that the labor situation is very materially improved, due to former employees applying for work, although many men employed during the strike have left the service with the receipt of their back pay. The Indianapolis committee says that practically 90 per cent of the yard brakemen employed at present have entered the service within the past two months. Labor efficiency is still reported as below normal at most points. Many of the committees report that there has been no complaint as to service from industries, but there are very general reports of inadequate car supply. The Twin Cities committee reported the car supply as adequate at the time, but said that many farmers were holding grain for higher prices and that in about two weeks there would be a much greater demand two weeks there would be a greater demand for cars.

Unscrambling the Freight Cars

One of the first tasks which faced the railroads when they were released by the government on March 1 was the unscrambling of the freight cars, which, under two years of pooling without regard to ownership had become abnormally scattered. Reports received by the Car Service division indicate that considerable progress is being made in the direction of getting the cars returned to the home roads, although at a rather gradual rate. On August 15, the date of the latest report, 27 per cent of home cars were on their home roads, while 73 per cent of the cars were away from home. On May 1, 1917, shortly after the United States entered the war and at the time of the organization of the Railroads' War Board, 52.8 per cent of the cars were on their home roads, which meant that on the average most of the other cars were not much further away than the lines of the direct connections of the owner. On March 1, when the roads were relinquished, after two years of car distribution without regard to ownership, the percentage of home cars on home roads was less than ever before; that is, it was 21.9.

The increase since then is only 5 per cent, but it has been effected during a time of great demand for cars when they could not be moved empty merely for the purpose of getting them at home. It is regarded as desirable to have the percentage of home cars as high as possible consistent with the demands of through traffic because the roads that have an adequate car supply, and their local shippers, are naturally entitled to the benefit of them, and also because cars are likely to be kept in better repair if they reach the home road frequently. A large part of the unscrambling that has taken place has been as a result of the efforts of the Interstate Commerce Commission and the Commission on Car Service to relocate box cars on the western roads and coal cars on the eastern roads, by issuing orders for the movement of specific numbers of empty box and coal cars by specified routes from eastern to western and from western to eastern lines, respectively. These orders have been issued not only for the purpose of meeting the demands for box cars for western grain and for coal cars in the mine territory, but also to get the cars home, and in each case the orders have specified cars of the ownership of the destination road. About 100,000 box cars have been transferred from eastern to western roads under these orders since May 1, until the supply of box cars on the western lines has been built up to a point where it is no longer considered necessary to keep in effect the general orders such as that issued by the Interstate Commerce Commission in May and reissued by the Commission on Car Service. Instead individual orders to individual roads are being issued from time to time as the occasion warrants for the purpose of maintaining the equalization as between eastern and western roads.

For July the average miles per car per day was 25.7 as compared with 21.3 in July, 1919, and as compared with 25.1 for the month of June, 1920. For the Eastern district the average was 22.8 as compared with 21.8 in July, 1919; for the Allegheny district 18.2 as compared with 16.2; for the Pocahontas district 44 as compared with 30; for the Southern district 28 as compared with 22; for the Northwestern district 25.6 as compared with 23.1; for the Central Western district 29.4 as compared with 22.9, and for the Southwestern district 26 as compared with 17.4.



AMERICAN RAILWAY ENGINEERING ASSOCIATION

A meeting of the Board of Directors of the American Railway Engineering Association and also of the General committee of the Engineering division of the American Railroad Association will be held in Montreal on October 11. Following this a visit will be made to the Quebec bridge. The Proceedings of the American Railway Engineering Associtaion are now off the press and are being distributed to the members. With the approach of the time when the reports of the committees must be completed for transmittal to the secretary, the activity of the various regular and special committees is being intensified. Recent meetings of the committees include those of the committees on Records and Accounts at Buffalo, Signals and Interlocking, Economics of Operation and Electricity at Chicago, Rail at New York (in conference with the rail manufacturers), Yards and Terminals at Atlantic City, Track at St. Louis and Roadway at Pittsburgh.

ROADMASTERS' ASSOCIATION

A complete report of the Roadmasters' convention will be found on page 385.

THE MASTER PAINTERS' ASSOCIATION

The convention of the Master Painters will be held at the Fort Shelby hotel, Detroit, in accordance with the program published in the September issue, except that additional items have been arranged for as given below:

TUESDAY P. M.

Paper on "Ladders and Scaffolds," by A. E. Davidson, The Patent Scaffolding Company, New York City.

Address on "Safety First," by P. Groome, safety agent, Union Pacific, Omaha, Neb.

WEDNESDAY

Paper on "The Modern Spray Machine and Its Adaptability to Railroad Painting," C. B. Lyons, DeVilbiss Manufacturing Company, Toledo, Ohio.

THURSDAY

Paper on "Modern Fire Retardant Paints—Their Effectiveness and Uses," G. F. Johnson, vice-president, Pyro-Non Paint Company, Chicago.

AMERICAN WOOD PRESERVERS' ASSOCIATION

Interest in the work of this association is now centered largely in the development of plans for the annual convention at San Francisco next January. Following a meeting of the executive committee at Madison, Wis., in July, tentative itineraries have been prepared via three routes which were presented to the executive committee at a meeting in Chicago on September 30.

At this meeting it was decided to arrange for special cars over the C. B. & Q. from Chicago, St. Louis and Kansas City to San Francisco, via Billings, Mont., and Seattle, Wash. The party will leave Chicago on Saturday evening, January 15, arriving in Seattle Tuesday evening, January 18. The remainder of the week will be spent in the timber, the saw mills, and the wood preserving plants in the Douglas fir areas of the Northwest. The party will leave Portland Sunday evening, arriving in San Francisco early Tuesday morning, January 25. In this way an opportunity will be afforded the members of the association to study at first hand the timber resources of the Pacific Northwest, to which they are looking for their materials to an increasing extent. Plans for the convention itself are rapidly assuming form. The committees are completing their reports and they will soon be in the hands of the secretary for distribution to the members. The proceedings of the 1920 convention are now in the bindery and should be ready for distribution before October 10.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION

The indications are unusually promising for a successful convention at Atlanta on October 26-28, inclusive. The Piedmont hotel has been selected as headquarters. Seven of the eight committee reports scheduled for presentation at the convention are already in the hands of the secretary, and it is expected that all of them will be printed and distributed to the members in advance of the convention. Arrangements are being made for special cars from Chicago to Atlanta, via Cincinnati and Chattanooga.

The program for the convention is as follows:

TUESDAY, OCTOBER 26

Morning Session

Convention called to order at 10 a. m.

Address of welcome by Eugene Black, *president, Atlanta Chamber of Commerce.*

Address of the president.

Reports of officers and committees.

Appointment of special committees.

Election of new members.

Report of Committee on The Abuse of Treated Timber, followed by motion pictures showing the application of wood preservative.

Afternoon Session

Call to order at 2 o'clock.

Report of Committee on The Repair and Maintenance of Tank Hoops.

Report of Committee on The Use of Electricity for Pumping Water.

Report of Committee on The Application of Paint by Spraying.

Paper on Recent Developments in Concrete (Proper Proportioning of Concrete Mixtures), by H. C. Boyden, Portland Cement Association, Chicago.

Adjournment at 4:30 to inspect exhibits of the Bridge and Building Supply Association.

Evening Session

Call to order at 7:30 p. m.

Paper on The Erection Features of the St. Charles Air Line Bridge, Chicago, illustrated by moving pictures and lantern slides, by Maro Johnson, assistant engineer, Lllinois Central.

Address on Housing and Feeding Maintenance of Way Employees on the Nashville, Chattanooga & St. Louis, by Hunter McDonald, chief engineer, N. C. & St. L.

Bridges and Bridge Work as Told by the Camera, by J. K. Melton, official photographer, Illinois Central.

WEDNESDAY, OCTOBER 27

Morning Session

Call to order at 9 a. m.

Report of the Nominating committee.

Report of the Auditing committee.

Report of committee on The Maintenance and Repair of Freight House Floors.

Report of committee on Filling Bridges, Maintenance of Structure During Filling.

Report of committee on Standard Forms for Bridge Inspection.

Afternoon Session

Call to order at 2 o'clock.

Report of committee on The Maintenance of Timber Docks.

A portion of the afternoon will be devoted to a trip to the new Hills Parks shops and the Chattahoochee River bridge of the N. C. & St. L.

Evening Session

The annual dinner will take place at 6:30 o'clock.

THURSDAY, OCTOBER 28

Call to order at 9 a. m.

Report of committee on The Reclamation of Bridge, Building and Water Supply Materials.

Annual business meeting.

Selection of next meeting place.

Election of officers.

The afternoon will be devoted to a barbecue at Stone Mountain, for which the Georgia Railroad will furnish a special train.

GENERAL NEWS DEPARTMENT

The Board of Directors of the Union Pacific have authorized the establishing of a minimum pension of $25.00 a month.

The Water Conservation Committee of Engineering Council has tendered its service to the Federal Power Commission to act in an advisory capacity on technical matters coming up before the commission.

The United States Labor Board held a hearing in Washington on September 8, when a number of grievances involving the employees of the American Railway Express Company were submitted.

Preparations are being made at St. Louis, Mo., for a railway exhibition, which will be held during the week of October 25 under the auspices of the Railroad Y. M. C. A. and the St. Louis Railway Club at the Railroad Y. M. C. A. building.

The Outlaw Switchmen's Strike, which has been in progress at Chicago for several months, came to an end early in September through a vote on the part of the outlaws to abandon the strike and apply to the railroads for employment under whatever terms the railroads are willing to offer.

The Australian Commonwealth Ministry has decided to secure the services of a railway expert from this country and one from Great Britain to act with an Australian railway man, as chairman, in an investigation of the question of a uniform railway gauge.

A commission of railway officers has been sent to this country by the government of the Netherlands to study American electrification methods with a view to considering their application to the electrification of the railway connecting Amsterdam, The Hague and Rotterdam, a distance of about 50 miles.

According to detailed figures, compiled by the Division of Statistics of the Bureau of Foreign and Domestic Commerce, the exports of rails in July totaled 51,869 tons, having a value of $3,329,530; of spikes, 2,845,462 lb., with a value of $123,574, and of switches, frogs, splice bars, etc., with a value of $735,726.

The American Steel Treaters' Society and the Steel Treating Research Society are now united in one organization known as the American Society for Steel Treating, this consolidation having taken place at the first session of their annual convention and exhibition held at the Commercial Museum, Philadelphia, September 14 to 18.

Groups of members of the American Society of Civil Engineers at New York and Chicago met recently to discuss the proposed amendments to the society's constitution and subsequently circularized the membership opposing those amendments which would change the society's form of government and authorize an affiliation with the Federated American Engineering Societies.

Freight traffic statistics show that the railroads of the United States handled a greater volume of traffic during the three weeks ending August 21 than was ever handled before during the corresponding week of preceding years, the number of cars handled in that time being 2,878,758 cars as compared with 2,628,714 and 2,868,373 for the corresponding three weeks in 1919 and 1918, respectively.

The Louisville & Nashville and the Nashville, Chattanooga & St. Louis are now carrying on experiments to determine the practicability of wireless service for use on the railroads. One of the most important applications suggested for a practical installation is a substitute for wire circuits along the Gulf coast, where it is almost impossible to maintain wire lines during storms.

After October 1 government shipments, consignments of authorized private merchandise and goods from nationalized factories will be carried free on railroads throughout Russia, according to an order made public in Moscow, Russia. Workmen and families on leave or changing their place of employment, invalids, students and workers en route to congresses will not be asked to pay transportation under the terms of the order.

Statistics of Railway Operation for the first six months of 1920 show that the gross operating revenues were $2,736,921,532, and that the railway operating expenses were $2,574,046,189, leaving net revenues to the amount of $162,875,343, as compared with $265,289,010 for the corresponding period of 1919. Expenditures for maintenance of way and structures for the first six months of 1920 amounted to $451,492,366, as compared with $371,005,985 for the first six months of 1919.

The fifteenth international conference of the Railroad Young Men's Christian Associations of North America will be held in Richmond, Va., November 18-21, 1920. It has been the custom to hold these conferences at three-year intervals, but the world war has interfered with this arrangement and this will be the first conference for a number of years. It is expected that about 1,200 railroad men will be present, representing every section of the country and every department of railroad service.

Frank Rhea, who as trade commissioner for the Bureau of Foreign and Domestic Commerce investigated the markets for American railway supplies in Australia and New Zealand and in China, Japan, and other countries of the Far East, is about to return to China in the capacity of industrial trade commissioner. His purpose will be to study and follow industrial development and transportation, and especially to investigate the feasibility of the investment of American capital in public and semi-public enterprises in China.

The Blaw-Knox Company recently presented its employees with life insurance as an indication of the value of loyalty, co-operation and continued service, this insurance covering not only death, but total permanent disability. All employees with not less than three months' service are insured for $500; those employed from six months to one year, $750, and those from one to two years, $1,000, the amount increasing thereafter at the rate of $250 for each additional year's service until a maximum of $2,000 is reached.

The Federal District Court for the Eastern District of Arkansas holds that the state may, under its police power, require a railroad to change its tracks when necessary for the protection of life or for the good of the public generally, but there must be fair and reasonable grounds for it, and the acts required to be done must have some effective relation to the end sought to be accomplished, and a state may not arbitrarily select a particular railroad company and require it to raise its tracks at a particular place for the alleged purpose of preventing the obstruction of traffic by overflow where the track is subject to overflow at the same time at other places, and where other roads through the state are subject to the same obstruction.

The first important step in a complex plan for the renewal of the superstructure of the Baltimore & Ohio bridge over the Allegheny river at Pittsburgh was completed on September 1 when two trusses with a total length of 410 feet were rolled out and a new double track deck girder span 97 feet long and a new double track through truss span 261 feet in length were rolled into place. Because of the heavy traffic passing over this bridge and the necessity of maintaining practically continuous service the new spans, which were of a total weight of 1,100 tons, were erected on falsework on the downstream side of the existing structure. Another span 434 feet long is now being erected and will be moved into its final position in a similar manner late in the fall, at which time the new spans referred to above will be raised approximately 15 feet vertically to bring them to the new level of the bridge.

PERSONAL MENTION

GENERAL

H. H. Temple, chief engineer of the Pittsburgh & West Virginia, with headquarters at Pittsburgh, Pa., has been appointed general superintendent of that road and the West Side Belt, with the same headquarters, succeeding **J. E. Fairhead,** resigned, effective September 1.

ENGINEERING

G. R. Smiley has been appointed chief engineer of construction for the Louisville & Nashville, succeeding **H. C. Williams,** resigned.

John Greer has been appointed assistant engineer of the Portland division of the Grand Trunk, with headquarters at Portland, Me., succeeding **R. F. Nicholson,** resigned, effective September 1.

R. H. Coulson has been appointed district engineer of the Western district of the New York Central, Lines East, with headquarters at Buffalo, N. Y., succeeding **N. F. Thompson,** deceased.

C. L. Spaulding, district engineer of the Electric zone, New York Central, Lines East, has been transferred to the Eastern district, with headquarters at New York, succeeding **B. S. Voorhees,** promoted.

C. B. Petticrew has been appointed division engineer on the St. Louis Southwestern, with headquarters at Illmo. Mo., and **W. G. Hazelwood** has been appointed assistant engineer at the same place.

E. E. Mayo, assistant division engineer of the Salt Lake division of the Southern Pacific, with headquarters at Ogden, Utah, has been promoted to division engineer of the Portland division, with headquarters at Portland, Ore., succeeding **H. M. Lull,** transferred to the Southern Pacific, Texas and Louisiana Lines.

H. M. Lull, division engineer of the Southern Pacific, Pacific System, with headquarters at Portland, Ore., has been promoted to succeed **E. B. Cushing,** engineer maintenance of way of the Southern Pacific, Texas and Louisiana Lines, with headquarters at Houston, Tex., who has resigned,

Ray H. Coulson has been appointed district engineer on the New York Central, with headquarters at Buffalo, N. Y. Mr. Coulson was born on February 9, 1882, at Buffalo and is a graduate of the Buffalo Central high school. He entered the employ of the New York Central & Hudson River as a chainman in 1901, later being made rodman and instrumentman. In 1904 he left railway work to go with the Rochester & Lake Ontario Water Company as assistant superintendent, returning to the New York Central the following year as an inspector, subsequently being promoted to assistant engineer, resident engineer and assistant district engineer. In 1917 he was appointed special assistant engineer at the Grand Central Terminal, with headquarters at New York.

H. B. Holmes has been appointed chief engineer of the Pittsburgh & West Virginia and the West Side Belt, with headquarters at Pittsburgh, Pa., succeeding **H. H. Temple,** promoted, as noted elsewhere. Mr. Holmes was born at Ferris, Ill., on July 13, 1875, and graduated from the State University of Iowa. His first railroad work was done for the Chicago, Burlington & Quincy during the vacation periods of his college course, as rodman, chainman and timekeeper. In 1900, he became rodman for the Kansas City, Mexico & Orient and remained with that company for eight years, serving as levelman, transitman, office engineer, engineer and assistant to the superintendent of construction. In 1913 he was appointed resident engineer at Kansas City, Mo., and in February, 1917, he was made chief engineer. He resigned from railroad work in September, 1917, to accept a position with the firm of Coverdale & Colpitts of New York, becoming principal assistant engineer in charge of the New York office in March, 1920, from which position he resigned to return to railroad work in the capacity noted above.

P. H. Winchester, division engineer on the New York Central, Lines East, with headquarters at Watertown, N. Y., has been transferred to the Syracuse division, with headquarters at Syracuse, N. Y. **A. R. Jones,** supervisor of track, with headquarters at Clearfield, Pa., has been promoted to division engineer, succeeding Mr. Winchester. Sub-divisions 13, 13A and 13B of the old Syracuse division have been added to the Buffalo division and placed under the jurisdiction of **B. M. McDonald,** division engineer at Buffalo, N. Y.

Louis V. Bean, who resigned as first assistant engineer of the Atlantic Coast Line in July, 1918, to accept a position in the Building division of the Construction division of the War Department, has been appointed recently chief engineer of the Georgia, Florida & Alabama, with headquarters at Bainbridge, Ga. Mr. Bean was born at Lexington, Ky., on April 3, 1887, and was graduated from the College of Engineering of the State University of Kentucky in 1907. He entered railway service with the Cincinnati, New Orleans & Texas Pacific as a rodman in the division engineer's office at Lexington. In May, 1909, he left that road to go with the Central of Georgia as a draftsman in the office of the chief engineer, being promoted to resident engineer in February, 1910. In 1911 he was again promoted, this time to assistant engineer, with headquarters at Savannah, Ga. On November 1, 1911, he resigned to accept a position as second assistant engineer in the office of the engineer of roadway of the Atlantic Coast Line, with headquarters at Savannah. In 1915 he was promoted to first assistant engineer, remaining in this position until July, 1918, when he resigned to enter the War Department, as noted above.

Louis V. Bean

C. M. Cannon, division engineer of the East Carolina division of the Seaboard Air Line, with headquarters at Charleston, S. C., has been transferred to the Alabama division, with headquarters at Savannah, Ga., succeeding **W. A. Greenleaf,** appointed assistant division engineer of the North Carolina division, with headquarters at Hamlet, N. C. **W. J. Gooding,** division engineer of the South Carolina division, with headquarters at Jacksonville, Fla., has been transferred to the East Carolina division to succeed Mr. Cannon.

O. F. McNairy has been promoted to division engineer on the Seaboard Air Line at Jacksonville, succeeding **W. J. Gooding.** Mr. McNairy was born at Greensboro, N. C., in August, 1889. He graduated from the State College of North Carolina in 1907, and entered railway service the same year as a chainman in the engineering department of the Seaboard Air Line. He subsequently served as an inspector, assistant engineer and resident engineer until February, 1917, when he was appointed inspector of construction in the Bureau of Yards and Docks of the Navy Department. In August, 1917, he was commissioned first lieutenant of engineers, returning to the Seaboard Air Line in February, 1918, as a corporate real estate agent. In May, 1920, he was promoted to assistant division engineer, remaining in that position until his recent promotion to division engineer.

E. B. Cushing, engineer of maintenance of the Southern Pacific, Texas and Louisiana Lines, with headquarters at Houston, Tex., resigned from railroad service, effective September 15. Mr. Cushing was born on November 22, 1862, at Houston, Tex. He graduated from the Texas Military

Academy and began railroad work in 1879 as a chainman for the Galveston, Harrisburg & San Antonio. Afterwards he served as land surveyor and assistant engineer. In 1882 he left that road, but returned in 1883 as division engineer. Later he was promoted to construction engineer and retained that position until 1887 when he went with the Gulf, Colorado & Santa Fe as office engineer and chief clerk of construction. He became assistant engineer of roadways, buildings and bridges of that road in 1888 and in 1889 was appointed resident engineer of the Southern Pacific, the Galveston, Harrisburg & San Antonio and the Texas & New Orleans, with headquarters at Houston. He was appointed engineer maintenance of way of the Southern Pacific lines in Texas and Louisiana in 1901. He became general superintendent of the Southern Pacific lines in Louisiana in 1904 and in March, 1908, was appointed chief engineer of construction of the Sunset-Central system in Texas and Louisiana. He was promoted to assistant general manager in 1916. When the United States declared war on Germany he was commissioned lieutenant-colonel of engineers and served with the American Expeditionary transportation forces. Late in 1919 he returned to this country and was appointed to the position from which he has just resigned.

R. S. Welch, acting division engineer on the Baltimore & Ohio, with headquarters at Cleveland, Ohio, has been promoted to division engineer, with headquarters at Newark, Ohio. Mr. Welch was born at Baltimore, Md., on December 3, 1884, and entered railway service with the Baltimore & Ohio in 1905 as an axeman, later serving as instrumentman. From 1909 until 1910 he served as transitman, being promoted in the latter year to draftsman and computer in the chief engineer's office at Baltimore, Md. In 1911 he was promoted to statistician in the general manager's office. He left the Baltimore & Ohio in 1912 to go with J. E. Greiner, consulting bridge engineer, as a draftsman, leaving shortly thereafter to become draftsman and computer for the Roland Park Company in Baltimore, Md. In 1913 Mr. Welch returned to the Baltimore & Ohio as assistant engineer in the maintenance of way department, later being promoted to assistant to the district engineer, which position he held until 1916, when he was appointed assistant division engineer, with headquarters at Seymour, Ind. In 1917 he was appointed assistant engineer in the chief engineer's office at Baltimore. From 1917 until 1919 Mr. Welch served with the Seventeenth Engineers (Railway) as a second lieutenant, first lieutenant, captain in charge of railroad construction, aide-de-camp to base commander, Base Section No. 1, and personnel adjutant of regiment. In 1919 he returned to the Baltimore & Ohio as division engineer at Cincinnati, Ohio, later in the same year being appointed special engineer in the federal manager's office. He was appointed assistant engineer, with headquarters in Cincinnati, early in 1920, later being promoted to acting division engineer.

TRACK

T. C. Barrett has been appointed roadmaster on the Des Moines division of the Chicago, Milwaukee & St. Paul, with headquarters at Des Moines, Ia., succeeding **J. P. Whalen,**

H. Rhoads has been appointed acting roadmaster of the Minnesota division of the Illinois Central, with headquarters at Dubuque, Iowa, in place of **J. F. McNamara,** who has been granted leave of absence.

Lars E. Larson, who has been promoted to district roadmaster on the Montana division of the Great Northern, with headquarters at Wolf Point, Mont., as noted in last month's issue, was born in Norway on May 3, 1888. He entered railway service with the Great Northern as a section laborer on June 21, 1909, and in March, 1910, was promoted to section foreman. He served in this capacity and as extra gang foreman until his recent promotion.

C. H. Morse has been appointed to supervisor of track on the New York Central, Lines East, with headquarters at Clearfield, Pa., succeeding **A. R. Jones,** whose promotion is noted elsewhere. **A. A. Johnson** has been appointed supervisor of track, with headquarters at Kingston, N. Y., succeeding **H. I. Hoag,** transferred to West Albany, N. Y., to succeed **T. F. Culligan,** supervisor of track at West Albany, who has been transferred to Corning, N. Y., succeeding **J. P. Sexton,** transferred to Lackawanna, N. Y.

Samuel C. Roper, who has been promoted to division roadmaster on the Great Northern, with headquarters at Havre, Mont., as noted in last month's issue, was born at Harrisburg, Ill., on June 17, 1877. He graduated from Manhattan College, Manhattan, Kan., in 1895, and entered railway service on March 14, 1897, as a section laborer with the Chicago, Rock Island & Pacific at Dwight, Kan., later being promoted to section foreman at Herington, Kan. He was promoted to yard foreman at Wichita, Kan., in 1899 and remained there until February, 1909, when he was appointed yard foreman on the Great Northern at Grand Forks, B. C. On July 3, 1912, Mr. Roper was promoted to roadmaster on the Marcus division, which position he held at the time of his promotion.

BRIDGE

V. A. Bennett has been appointed assistant bridge and building supervisor of the Montana division of the Northern Pacific, effective August 16.

O. V. Chesney has been appointed supervisor of bridges and buildings of the Southern district of the Portland division of the Southern Pacific, Pacific System, with headquarters at Portland, Ore., succeeding **C. W. Smith,** resigned.

J. F. Cullen has been appointed supervisor of bridges and buildings on the Oregon Short Line, with headquarters at Pocatello, Idaho, and **A. H. King,** supervisor of bridges and buildings, has been transferred to the territory between Sandy and McCammon, not including McCammon yard.

P. L. Barker, assistant engineer in the bridge and building department of the New York Central, Lines East, has been promoted to supervisor of bridges and buildings, with headquarters at Watertown, N. Y., succeeding **J. H. Vosburgh,** transferred to Buffalo, N. Y. Mr. Barker was born at Mason Village, N. H., on August 30, 1870, and graduated from the Thayer School of Civil Engineering. He entered railway service with the New York Central in February, 1901, being later promoted to assistant engineer in the engineering department. In April, 1904, he was promoted to supervisor of bridges and buildings, remaining in this position until the advent of government control, when he was transferred to the corporate chief engineer's office. Later in 1918 he was appointed assistant engineer in the bridge and building department. On the return to private control he continued in this capacity until his recent promotion to supervisor of bridges and buildings, as noted above.

PURCHASES AND STORES

Henry Hansen, chief clerk to the purchasing agent of the Northern Pacific, has been appointed assistant purchasing agent, with headquarters at St. Paul, Minn.

OBITUARY

B. F. Pickering, supervisor of bridges and buildings on the Boston & Maine, with headquarters at Salem, Mass., died on August 30, after a short illness.

George Leighton, civil engineer and formerly assistant engineer on the Delaware, Lackawanna & Western at Bath, N. Y., died on September 13 at Glenburn, Pa., at the age of 62. After his service with the Delaware, Lackawanna & Western, Mr. Leighton was associated with the planning and construction of the Pennsylvania tunnels under the East river, also of a terminal at Charleston, S. C.

Wlliam Harley Moore, engineer of structures for the New York, New Haven & Hartford and the Central New England, died on September 5 in New Haven, Conn. Mr. Moore was born on September 12, 1860, at Limerick, Ireland, and received his technical education at Queen's University and the Royal University, Ireland. He entered railway work in America as assistant to the bridge engineer of the New York Central & Hudson River in 1885. In May, 1886, he left that road to enter the service of the New Haven, where he remained continuously until his death. He was appointed bridge engineer on the New Haven in February, 1890, and in May, 1913, was promoted to the position of engineer of structures, which position he held until the time of his death.

CONSTRUCTION NEWS

The Atchison, Topeka & Santa Fe is accepting bids for the construction of a machine shop at Albuquerque, N. M. This shop, which is to be 240 ft. by 604 ft., will be the central structure in a group of six other buildings, including a flue shop, pattern shop, cab painting shop, waste cleaning shop, fire department building and babbitt shop. The construction will cost approximately $2,000,000.

This road has let a contract to Jerome A. Moss, Chicago, for the construction of a water station at Galatia, Kan., together with a treating plant and a service tank.

The Chicago & North Western has awarded a contract to Peppard & Burrill, Minneapolis, Minn., for the construction of an 840 ft. extension to ore dock No. 3 at Ashland, Wis. The entire construction, including the materials, will cost approximately $1,250,000.

This road has let a contract to the Allington-Miller Company, Chicago, for the construction of a passenger station, 20 ft. by 90 ft., of stucco construction, at Franklin Grove, Ill.

The Canadian National Railways have made plans to build a new bridge over the Petitcodiac river at a point 14 miles from Salisburg, New Brunswick. It will consist of four pony truss spans 104 ft. 7 in. long. Work on the substructure will be carried out by company forces, while the contract for erecting the steel spans has not yet been let.

The Canadian Northern has let a contract to the Roberts & Schaefer Company, Chicago, for the installation of an electrically-operated Duplex patent shallow pit feeder in one of the deep pit plants constructed some years ago at Monk, Quebec.

The Chicago, Burlington & Quincy has awarded a contract to D. J. Jobst, Lincoln, Neb., for the construction of a new passenger and freight station at Seneca, Neb. The building will be 24 ft. by 100 ft. and will be of brick veneer, stucco and tile construction.

This company has awarded a contract to E. J. Claffey & Co., Chicago, for the installation of a complete heating and washout system in a new 16-stall roundhouse now under construction at Galesburg, Ill.

The Chicago Great Western is accepting bids for enlarging its passenger station at South St. Paul, Minn. The building will be lengthened approximately 50 ft. and is to be equipped with a complete steam heating plant.

The Chicago, Rock Island & Pacific has let a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of a complete water treating plant at Kellogg, Iowa. The Rock Island has also awarded a contract to T. S. Leake & Co., Chicago, for the construction of an eight-stall roundhouse at El Dorado, Ark.

This road has also awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of a new electrically-operated hoisting control apparatus at Atlantic, Iowa.

The Chicago Union Station Company is asking bids for the construction of a viaduct at Twelfth street, Chicago. The viaduct, which is part of the Chicago Union station project, will extend from Canal street to the Chicago river, and will be of reinforced concrete construction.

The Denver & Rio Grande proposes to build an engine house of frame and corrugated iron construction, to hold four engines, at Montrose, Colo., at a cost of about $10,000, including the necessary tracks.

The Gulf Ports Terminal has applied to the Interstate Commerce Commission for a loan of $500,000 to enable it to resume the construction of 26 miles of unfinished line between Pensacola and Mobile, on which the roadbed has been finished for 18 miles, and also for the betterment of 46 miles of road now in operation and the purchase of some additional equipment.

The Illinois Central expects to complete the construction of a second track from Clinton, Ill., to Heyworth, Ill., a distance of approximately 8½ miles, about November 1, at a cost of approximately $300,000. The second track, which this company is constructing from Amboy, Ill., to Sublet, a distance of 5½ miles, will also be completed November 1. This company is extending yard tracks at Freeport, Ill., at a cost of approximately $175,000. This company began work September 1 on a frame passenger station at Newbern, Tenn. The structure, which will be 24 ft. by 80 ft., will cost approximately $30,000 and will be completed November 15.

The North Carolina Roads (Electric) will complete surveys soon on the first 25 miles, and three-fourths of the right-of-way has been obtained for a proposed electric line to be about 82 miles long from Mt. Holly, N. C., via Denver, Newton, Hickory, Lenoir to Blowing Rock. The present plans call for the construction of the line to Blowing Rock, later to connect with a railroad at Shulls Mill.

The Northern Pacific has ordered the mechanical equipment for a 200-ton frame coaling station at Logan, Mont., from the Ogle Construction Company, Chicago.

The Ogden Union Depot Company will make improvements in the railroad yards at Ogden, Utah, at a cost of $1,000,000. The work will include the construction of a new ice manufacturing plant of 250 tons daily output, a storage house of 20,000 tons' capacity, and an increase in the trackage in the yards. The new ice plant and storage house will replace and occupy the site of an ice plant which was destroyed by fire. The yard tracks will be extended to the west of the present freight tracks, and the old Union Pacific roundhouse will be removed.

The St. Louis Southwestern plans to spend approximately $5,000,000 within the next 12 months on the improvement of its properties. Among the larger items are, more than $1,000,000 for 21,000 tons of steel rails which will be used to relay 157 miles of track; $755,000 for widening cuts and fills and filling in trestles; $500,000 for ballast (750,000 cu. yd. of washed gravel having already been contracted for); $459,000 for betterments to bridges, trestles and culverts; $300,000 for additional side tracks, and over $170,000 for additions to and enlargement of existing station facilities, water stations, shop buildings, etc.

The Southern Pacific has under construction in the block bounded by Third, Fourth, Channel and Berry streets, San Francisco, Cal., a building to be occupied by several large wholesale grocery firms and estimated to cost $1,500,000. The structure is to be a six-story building of steel and reinforced concrete of the flat slab type. It will have water, rail and motor transportation facilities, elevators, chutes and conveyors especially designed for the wholesale grocery business.

The Union Pacific has applied to the Interstate Commerce Commission for a certificate of public convenience and necessity for the construction of an extension from the end of the present track of the North Platte branch, two miles west of Haig, Neb., for a distance of 29 miles in Scotts Bluff County, Neb., and Goshen County, Wyo., as part of a proposed main line from O'Fallons, Neb., to Medicine Bow, Wyo., on which the distance will be many miles shorter and the summit 1,000 feet lower than the present double-track main line through Cheyenne and Laramie.

Following a decision of A. M. Barrett, acting public service commissioner, approximately 550 employees of the New York Transfer Company and the Westcott Express Company, who had been on strike for one week, returned to work on Monday, August 30. Passengers passing through the city during this period were forced to pay exorbitant prices for the transfer of baggage and are said to be now paying cheerfully an increase of 25 cents a piece on such baggage. Mr. Barrett states that the strikers are granted about 22 per cent increase in pay. The principal employees will receive $32 a week, with overtime payments of 90 cents an hour on ordinary days and $1.20 an hour on Sundays and holidays. The length of the work day, now 10 hours, with an hour for dinner, is to be the subject of negotiations.

SUPPLY TRADE NEWS

GENERAL

The H. K. Ferguson Company, Cleveland, Ohio, has transferred its Indianapolis, Ind., office to the Rookery building, Chicago. **Major O. C. F. Randolph,** who has been district manager at Indianapolis, becomes district manager at Chicago.

The Schierbecker Tie & Lumber Company, St. Louis, Mo., has been reorganized and incorporated under the firm name of the Central States Tie & Lumber Company. H. F. Schierbecker is president and will have charge of the tie branch of the business, and C. A. Neuenhan, secretary and treasurer, will be in charge of the lumber department.

Dwight P. Robinson & Co., Inc. (with which Westinghouse, Church, Kerr & Co., Inc., was recently consolidated), engineers and constructors, of New York, has established a new branch office in the Home Savings & Loan building, Youngstown, Ohio, in charge of **C. I. Crippen.** The company recently moved its Cleveland office from the Leader News building to the Citizens building, and **H. P. Clawson,** who was for several years a member of the Chicago staff, has been transferred to Cleveland to take charge of this office.

PERSONAL

C. G. Cope has been appointed district sales manager of the Philadelphia territory of the Minwax Company, Inc., New York City, with offices at 507 Schubert building, Philadelphia, Pa.

Morton C. Andrews, vice-president of the Unit Construction Company, St. Louis, died on August 9 at Fall River, Mass.

J. C. Blanton, formerly for ten years manager of the Jackson Terminal Company, is now associated in a sales capacity with Manning, Maxwell & Moore, Inc., 119 West Fortieth street, New York City.

Charles Whiting Baker, for many years editor-in-chief of Engineering News, and since 1917 consulting editor of the Engineering News-Record, announces his resignation and the establishment, under his direction, of the **Engineering Business Exchange,** 31 Nassau street, New York, an agency to bring together those desiring to sell any sound engineering or technical business — manufacturing, constructing, selling, or professional—and those seeking opportunities to purchase. Mr. Baker graduated as a civil engineer from the University of Vermont in 1886. From that time to 1895 he served as associate editor of Engineering News, when he became editor-in-chief. From 1898 to 1911 he was also vice-president and director of the Engineering News Publishing Company. In 1917 he was appointed consulting editor of the Engineering News-Record. He has been a member of the American Society of Mechanical Engineers since 1893, and was vice-president of that society in 1909-1911. He served as vice-president of the American Society of Terminal Engineers in 1919-1920, and has been a member of the Engineering Council since its organization in 1917, representing the American Society of Mechanical Engineers.

C. W. Baker

Captain George B. Malone, who formerly served with the United States Army Engineers and later was general manager of the K-G Welding & Cutting Company, New York City, has recently been placed in charge of the Philadelphia (Pa.) office at 929 Chestnut street.

Walter Rautenstrauch, professor of mechanical engineering at Columbia University for the past 14 years, has been elected vice-president of the J. G. White Management Corporation in charge of its industrial department, with office at New York City, and in addition will continue to hold his professorship at Columbia.

H. A. Noble, vice-president of the Pittsburgh Spring & Steel Company, Pittsburgh, Pa., has been elected president to succeed D. C. Noble, deceased. **S. F. Krauth,** secretary and assistant treasurer, has been elected vice-president and treasurer, with headquarters at Pittsburgh. **J. N. Brownrigg,** eastern sales agent at New York, has been elected vice-president and eastern representative at New York, and **M. F. Ryan,** western sales agent at Chicago, has been elected vice-president and western representative, with headquarters at Chicago.

Charles H. Motsett, superintendent of the New York division of the New York, New Haven & Hartford, with office at Harlem River, N. Y., resigned recently to become general sales manager for the DeMayo Engineering Corporation, designers and manufacturers of portable elevators and conveyors for the handling of bulk material. Mr. Motsett's new headquarters are at pier 62, North river, New York. He was born in Peoria, Ill., on December 4, 1873, and began railway work in 1892 as a yard clerk with the Chicago, Rock Island & Pacific at Peoria. He subsequently served as chief clerk to the general yardmaster, and from 1902 to 1903 as assistant night yardmaster at Rock Island, Ill., and as assistant general yardmaster. He then served as general yardmaster, Council Bluffs, Iowa, until 1904, and during the next two years served in the same position at Des Moines and at Valley Junction, Iowa. In 1906 he left the service of the Rock Island to become trainmaster at Des Moines, on the Minneapolis & St. Louis, and two years later went to the New York, New Haven & Hartford as trainmaster at Harlem River, N. Y. He subsequently served on the same road from 1913 to 1914 as superintendent of the New York division at Harlem River and then went to the Panama Railroad, where he remained for two years as superintendent at Balboa, Canal Zone. He returned in 1916 and was appointed superintendent of the New London division of the New Haven. From 1917 until his resignation he served as superintendent of the New York division.

Charles H. Motsett

C. O. Deabler, tie and lumber agent of the Missouri Pacific and formerly tie and lumber agent of the Southwestern region of the United States Railroad Administration, has become associated with the Abeles & Taussig Tie Corporation, St. Louis, Mo. Mr. Deabler and **J. A. Brewer** assumed charge of the lumber department on September 1.

Robert M. Gates has been appointed managing engineer in charge of the Philadelphia, Pa., district of the Lakewood Engineering Company, Cleveland, Ohio, with offices at 1034 Widener building, Philadelphia. Mr. Gates is a graduate of Purdue University. He has been active in organizing the Material Handling Section of the American Society of Mechanical Engineers, and is acting as chairman of that

section during its period of organization. He has devoted the past 12 years to the design, application and engineering surveys of mechanical means of conserving labor in the construction, industrial and transportation fields.

William S. Noble has been appointed manager of the railroad department of the **Standard Paint Company,** with offices in New York and Chicago. He was born at Danville, Ky., and began railway work in 1887 as secretary to vice-president of the Lehigh Valley. He was later assistant in the president's office of the same road, and from 1905 to 1909 was assistant to president of the Seaboard Air Line, the Clinchfield Coal Corporation and the Carolina, Clinchfield & Ohio Railroad at New York. He then was appointed president's assistant with the Lehigh Coal & Navigation Company, Philadelphia, and in 1914 entered the service of the Standard Paint Company, New York, in its railroad department. He subsequently served as western representative, from which position he was recently promoted to manager of the railroad department of the same company.

William S. Noble

A. B. Way, secretary and general manager of the Bridgeport Chain Company, has been appointed district sales manager for New England of the Chain Products Company, with headquarters at 150-152 Chambers street, New York City. Prior to his identification with the chain industry, Mr. Way was affiliated with various New England manufacturing institutions. He was associated with every stage of development of the Bridgeport Company, serving first as factory superintendent and later as secretary and general manager. During the war Mr. Way was elected chairman of the Board of Weldless Wire Chain Manufacturers of the Chain division of the War Industries Board, this division being composed of manufacturers of chain of all kinds in the United States. This appointment in no way interfered with his activities or duties with the Bridgeport Chain Company, where he remained until his recent appointment.

TRADE PUBLICATIONS

Locomotive Shops.—Dwight P. Robinson & Co., New York, consolidated with Westinghouse, Church, Kerr & Co., has issued a folder containing 13 photographs of the Baltimore & Ohio locomotive shops at Glenwood, Pa., and Cumberland, Md., which were built by Westinghouse, Church, Kerr & Co.

The Story of Gasoline.—The Atlantic Refining Company, Philadelphia, has issued a 40-page pamphlet, containing a great many useful and interesting facts concerning the properties of gasoline. A chapter on carburization discusses the effect on efficiency and power brought about by variations in the mixture, while six pages at the end of the booklet are devoted to a classified list of engine troubles with their remedies.

Mill Buildings.—The National Lumber Manufacturing Association, Chicago, is issuing a new series of technical bulletins prepared by its engineering bureau. These are prepared in loose-leaf form in sheets 8½ by 11 in. and the initial issue which has just been released covers various considerations relative to mill building construction, including such matter as design, cost, kind of timber, specification and details of construction.

Timber Preservation.—The Allis-Chalmers Manufacturing Company has reprinted its bulletin No. 1439-B, which was issued originally in October, 1916, containing detailed information concerning the treatment of timber by the various processes and the equipment which it makes for that purpose.

Type "B" Erie Shovels.—The Ball Engine Company, Erie, Pa., has recently issued Bulletin S16, 24 pages, illustrated, devoted to a description of the type "B" steam shovel manufactured by that company. The photographs show the various sizes of this type shovel operating under a wide variety of conditions and also how it may easily be converted for crane service. The data is complete, giving sizes, capacities and results obtained in different classes of service.

Portable Steel Buildings.—The Blaw-Knox Company, Pittsburgh, Pa., has issued a 32-page catalog, illustrating and describing the line of portable steel buildings manufactured by that company. There are photographs and short accounts of the use of these buildings for a number of different purposes, including labor camps, field offices, watchmen's shanties, industrial buildings, etc. The latter part of the catalog is devoted to general plans for the various standard structures.

RED PLOT EXPOSED

A "red" plot is supposed to have been nipped in the bud at Springfield, Ill., when on Sepember 5 several foreigners were arrested by federal authorities working in conjunction with the detectives of the Illinois Central. One of the men arrested confessed to a plot to wreck an Illinois Central passenger train, hold up the passengers and rifle the mail coaches as a means to obtain funds to carry out their Soviet plans for the future. The bandit stated that the holdup was to take place at a signal tower not far from Springfield, where a section of rail was to be removed, that the farmhouses of the neighborhood were to be picketed to prevent disclosure of the holdup and that all necessary arrangements had been made for the get-away. Eight of the men arrested, who it is stated are thought to be leaders in the plot, were indicted by the Sangamon County Grand Jury on September 9, and the bond of each was fixed at $10,000. On September 13 one of these men plead guilty and was sentenced to the penitentiary for a term of from 5 to 25 years.

NEW PRODUCE TERMINAL PROPOSED AT CHICAGO

A new wholesale fruit and produce terminal will be built in Chicago, if plans, now being formulated by the Produce Terminal Company Trust, composed of many of the larger produce firms now located on South Water street, Chicago, materialize. Because of street improvements in Chicago, a portion and perhaps all of the produce business which is now confined to South Water street will have to be conducted elsewhere, and the Produce Terminal Company Trust has formulated plans for the re-location of the business which will be presented to the city council this fall in the form of an ordinance seeking the approval of the project.

The territory under consideration as the new wholesale market covers approximately 20 acres lying between the Chicago, Rock Island & Pacific tracks on the east, Stewart avenue on the west and Archer avenue on the south. The property is now owned by the Atchison, Topeka & Santa Fe.

In addition to the wholesale fruit terminal, the plan also provides for the construction of an outside yard where cars of produce coming into Chicago can be assembled and moved into the central market. By the utilization of such a yard, the cars scheduled for re-shipment to other cities will not be brought into the yards of the central market, but will be held in the outer yard for transfer.

According to the promoters of the plan, the wholesale terminal will be accessible to all of the railroads entering Chicago on an equal basis and for that reason they believe that little trouble will be experienced in obtaining the approval of all the railroads involved. The location of the outside yard has not yet been made public.